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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Fourteenth Annual Meeting, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION, OFFICE OF THE SECRETARY, COLUMBUS, OHIO, Feb. 15, 1897.

The Fourteenth Annual Meeting of the Ohio Gas Light Association will be held at Cleveland, Ohio, March 16th and 17th, 1898. The following papers will be read:

"The War of the Incandescents: Gas vs. Electric," by J. H. Maxon, Superintendent Gas Company, Gallipolis, Ohio.

"How to Avoid Competition in a Small Town," by E. G. Schmidt, Superintendent Gas and Electric Company, Sandusky, Ohio.

"Still Another Purifying Box," by Irvin Butterworth, General Manager, The Columbus Gas Company, Columbus Ohio.

"Comparative Results with and without the Use of a Continuous Oxide Revivifier," by Moses Coombs, Superintendent Gas Company, Youngstown, Ohio.

Besides the foregoing, there will be the usual short discussions, and the members are requested to send subjects for same to the Secretary, in order that they may be inserted in the program.

The hotel headquarters will be at the Hollenden, at which place the meeting will also be held. The management of the hotel have named a rate for this meeting of from $3 to $5 per day, on the American plan, and from $1 to $3 per day, on the European plan. Street cars at the Union depot lead direct to the hotel.

Blank applications for membership can be obtained of the Secretary, who will be glad to furnish any information desired regarding the meeting. Yours truly, A. P. LATHROP, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION, OFFICE OF SECRETARY, NEW ALBANY, IND., Feb. 14, 1898.

Mr. E. H. Jenkins, who was elected Editor of the "Wrinkle Department" of the Western Gas Association, desires that those who contemplate contributions to this valuable department should forward the same at their earliest convenience. This department is open to the voluntary contribution of all. Any unique, original or simple device, which is of value in saving labor or of affording better service, should be sent to Mr. Jenkins before March 20. It is hoped that members of the Association will have no hesitancy in forwarding their "Wrinkles" promptly to Mr. Jenkins. Address all communications to E. H. Jenkins, Engineer Buffalo City Gas Company, Buffalo, N. Y.

JAS. W. DUNBAR, Secretary.

OBITUARY NOTE.—MR. JAMES D. THOMPSON.

Last week we had to chronicle the death of Mr. J. D. Thompson, Treasurer of the Laclede Gas Light Company, of St. Louis, whose response to death's summons was made the morning of the 15th inst. A patient sufferer for many weary months, the close of his life was witnessed by those who, in its continuance, were reared and guarded by him. Conformably to our promise of a week ago, the following succinct account of his useful career is put upon the record.

James Dulty Thompson, who was born in Wheeling, Va., January 15, 1833, was the youngest of a family of nine. While still a student he also was a teacher, devoting some hours of many days to the instilling in others of the underlying principles of mathematics and languages, along which lines he early showed especial proficiency. The circumstances of his people (his father died when the subject of this sketch was 3 years of age) were such that at an early age he engaged in the task of contributing to the support of his mother and sisters, and, relinquishing his natural desire for continued study, at the age of 16 he entered the employ of the Merchants' Bank, of Virginia, in Wheeling, as a clerk. The construction of the Baltimore and Ohio Railroad, the first iron way over the mountains, was shortly afterwards undertaken, and young Thompson was entrusted with carrying the money to the contractors for the payment of their employees. These journeys, made often on horseback through wild mountainous regions, were punctuated by many interesting and exciting experiences. After re-

ceiving successive promotions in the Wheeling bank, that institution (in 1855) appointed him cashier and manager of its newly-established branch at Point Pleasant, at the mouth of the Kanawha river. During his residence here the Civil War broke out, and his bank assisted in the disbursement of funds for army and hospital work. Later, during a guerrilla raid, the object of which was the looting of the bank, he had a narrow escape from the vengeance of the raiders, when they found that he had placed the money in safety on the other side of the Ohio river. In 1863 he accepted the appointment of cashier to the First National Bank, of Cincinnati, which had been reorganized on the lines of the newly-established national banking system. In 1865 he organized the Central National Bank, of Cincinnati, and was chosen its first President. About this time he became interested with the famous General Pillow in the cotton plantations of Arkansas, buying Johnson Place, on the Mississippi river, in 1866, and making further investments in sugar property in the Bayou Teche district of Louisiana the following year. That period having been in the reconstruction times, when negro labor was badly disorganized, and also the year of severe floods, and prior to the repair of the levees that had been destroyed during the war, these investments proved disastrous, and Mr. Thompson lost heavily. In the latter 60's he was associated with the well-known New York city banking firm of Soutter & Co., through whom arrangements for the financing of the then new Laclede Gas Light Company, of St. Louis, were later conducted; and, in January, 1875, he went to St. Louis as the Laclede Company's Secretary and Treasurer. This dual position he held until, on the consolidation of the several gas interests in St. Louis (1889 90), in which he took an initiative and active part, he was elected Vice-President of the reorganized Laclede Company. In 1893 he became Treasurer of the Company, and held that office until his death. He was a member of the Western Gas Association (May, 1884), and joined the American Gas Light Association, at the meeting held in Cincinnati, October, 1885. He was Secretary of the Gas and Electric Building and Loan Association, of St. Louis, and was also interested in several other business enterprises. He was a Ruling Elder in the Second Presbyterian Church of St. Louis, was Treasurer of its Benevolent Fund, and was active in other church work. He was twice married—in 1854, to Miss Louise Stillwell, of Wheeling, who died in 1865; and in 1868 to Miss Georgia Treadway, of New Haven, Conn., who survives him, as do six children—three by each marriage. The funeral services were held in the new chapel of the Second Presbyterian Church, St. Louis, on the 17th inst. The Elders of the Church acted as honorary bearers, the active bearers being eight gentlemen from the office of the Laclede Company. The interment was made in the Bellefontaine Cemetry, St. Louis. And this is the plain life record of a man who was respected by his business associates, esteemed by his friends and loved by his family.

BRIEFLY TOLD.

THE INTERNATIONAL MEETING OF THE GAS, ELECTRIC AND STREET RAILWAY INTERESTS OF TEXAS AND MEXICO.—The JOURNAL for January 24th reported that, as the result of a meeting, held in Austin, Texas, early in January, by the executive committees of the Texas Gas and Electric Light Association and the Texas Street Railway Association, it was decided to hold a joint meeting of both Associations in Laredo, Texas, March 9, 10, 11 and 12. The further understanding reached was that an unlimited invitation to those interested in the gas, electric and street railway interests of Mexico, to take part in the meeting, be extended. Those present at the meeting for arranging the preliminaries were: Messrs. L. T. Fuller, President of the Texas Gas and Electric Light Association; W. E. Holmes, Secretary of the Association; Thos. D. Miller, of Dallas; R. S. Wakefield and Geo. H. Cushman, of San Antonio; C. F. Yaeger, of Laredo; Carl F. Drake, of Austin; F. E. Scovill, of Austin; C. L. Wakefield, of Dallas; and J. H. Fitzgerald, of Houston, by proxy. Mayor Christen, of Laredo, and Mr. Yeager, of the same city, vouchsafed that everything possible for the proper conducting of the meeting and the comfortable accommodation of those who attended it would be done. Since the preliminary meeting we have received the complete programme for the business sessions, which are to be held in this order: March 9, morning, afternoon and night; welcome and responses thereto, addresses by the officers, reports of officers, reports of committees, etc., reading of papers; March 10, morning; papers and discussions; afternoon, papers and discussions; evening, papers and discussions; March 11, morning; papers and discussions; afternoon, papers and discussions, to be followed by an excursion to the coal mines on the Rio Grande river, a few miles above Laredo; night, a banquet to the delegates and guests. March 12, morning; papers and discussions, unfinished business, election of officers, appointment of general committees, reports of special committees, etc.; afternoon, an excursion to Monterey, Mexico, and other points of interest in and about that famous city and adjoining places. March 13 (Sunday) will be taken up mainly in inspecting the noted gold and silver mines of Monterey, and we are obliged to say that a visit to "El Toro" will be the feature for Sunday afternoon. By Monday morning all will be homeward bound, via the "two Laredos," as the programme puts it. No less than 17 papers have been listed, but as the Associations joining in the convention will hold some separate sessions (that is, concurrently, but in different rooms), no difficulty will be encountered in clearing up the order of business. Secretary Holmes informs us that the International and Great Northern Railway, with its connecting lines in Texas, New Mexico, Oklahoma, Arkansas and Louisiana, has agreed to make the following rates for transportation to and from the meeting: 167 miles or less, $5 per round trip; over 167 miles, one cent per mile each way added to the $5 rate above specified. Local ticket agents will inform intending travelers as to selling rates and time limits. The projected meeting is on a huge scale, but every indication now is that it will be successfully carried out.

AN INVITATION.—We invite the attention of our readers to the description and sketch in this number of the JOURNAL of a famous old American gasholder. The days of such holders are rapidly passing by, and it seems not unfitting that at least some description of them be recorded in our columns. If any of our readers having charge of or acquaintance with such holders (of interest, either from historical association or obsolete type of construction) will send us sketches, photographs or descriptions of the same, we will take pleasure in publishing such matter.

AFTER-THOUGHTS OVER THE NEW ENGLAND MEETING.—No. I.

By "ONE WHO WAS THERE."

The twenty-eighth annual meeting of the New England Association of Gas Engineers has passed into history and stands upon record as one of the most successful the Association has ever held. The interest felt in the meeting called out the largest attendance in the history of the organization, 96 members having been present, besides about 30 guests; and all remained in close attention to the sessions from the call to order to the final adjournment. The history of the New England Association, as one of the leading gas organizations of the country, is worthy of a moment's consideration. The advantages of association among the gas men were early recognized in New England, and the New England Association may be considered as having been contemplated as early as Feb. 16, 1861; for there is on record a call for a conference of gas men, for the purpose of considering the preparation of a law for the inspection of meters and the regulation of gas companies, signed by Messrs. Greenough, of Boston; Bryant, of Lowell; Cabot, of Lawrence; Brown, of Salem; and Clarke, of Roxbury. Although there is record that several meetings took place, no record of the proceedings is known, and a gap exists from then until February, 1871, when the New England Association of Gas Engineers was formally organized, with 16 gentlemen present as signers of its constitution. And it is worthy of note that of this number eight are still alive and retain their membership in the Association. From that starting point the Association has steadily grown to its present list of over 160. It is one of the earliest bodies organized in this country to discuss technical questions. Its organization antedates the American Association, and it numbers that body among its six hardy Gas Association children.

The idea of its originators was to band together for mutual information the practical gas makers of New England, and the strict adherence to this idea has made possible the close friendship which exists among the New England men, and has made easy that free exchange of information, a small percentage only of which ever reaches print. This undoubtedly is the true source of success, when combined with the openhanded hospitality and welcome with which it greets all comers to its doors, be they gas men or tradesmen. Its list of invited guests exceeds the list of members; and, as one of the committee of welcome expresses it, "You have all the privileges of the members—except paying dues." During its 28 years of life it has held within its doors, at one time or another, nearly every gas man of prominence in the country, while its list of members has contained no small percentage of the bright gas men of the day. It has furnished 6 of the 18 Presidents of the American Gas Light Association, and has many members and ex-members throughout the country.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 293.]

PROCEEDINGS, TWENTY-EIGHTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 16 AND 17, 1898.

FIRST DAY, FEB. 16—MORNING SESSION.

Following the reference of the President's Address to a committee of three (Messrs. C. H. Nettleton, H. A. Allyn and A. B. Slater), came the

REPORT OF THE TREASURER,

which showed that the moneys received during the year ended Feb. 15, 1898, amounted to $855.68, the expenditures for the same period amounting to $794.88, leaving a balance to credit of $160.80. There was a further credit balance in the treasury amounting to $500. The report had been passed upon by the auditing committee as correct.

The

ROLL CALL

was responded to by the following:

Honorary.

Benson, Col. F. S., Brooklyn, N. Y.

Active.

Addicks, W. R, Boston, Mass.
Africa, W. G., Manchester, N. H.
Allyn, H. A., E. Cambridge, Mass.
Anderson, W., East Boston, Mass.
Atwood, H. A., Plymouth, Mass.
Bartlett, L., Cottage City, Mass.
Burritt, D. F., Rockville, Conn.
Coffin, J. A., Gloucester, Mass.
Coggeshall, H. F., Fitchburg, Mass.
Cooper, A. F., Exeter, N. H.
Cowperthwaite, G. E., Danbury, Conn.
Coyle, P., Charlestown, Mass.
Crafts, D. W., Northampton, Mass.
Crafts, H. C., Northampton, Mass.
Davis, F. R., Athol, Mass.
Dye, N. C., Rutland, Vt.
Fowler, S. J., Springfield, Mass.
Frost, C. T.
Gould, J. A., Boston, Mass.
Goulding, N. O., Natick, Mass.
Harbison, J. P., Hartford, Conn.
Hassett, E. J., Beverly, Mass.
Hayden, W. H., Bath, Me.
Hintze, T. H., Malden, Mass.
Horton, A. J., Brattleboro, Vt.
Hurlburt, S., Norwich, Conn.
Jenks, Z. M., Woonsocket, R. I.
Jennings, F. W., S. Framingham, Mass.
Kelley, H. H., Chelsea, Mass.
Lamson, C. D., Worcester, Mass.
Lane, F. H., Wallingford, Conn.
Lane, H. M., Leominster, Mass.
Leach, H. B, Taunton, Mass.
Learned, E. C., New Britain, Conn.
Learned, W. A., Newton, Mass.
Macmun, G. F., Marlboro, Mass.
Manchester, G. L., Easthampton, Mass.
Mansfield, G. W., Salem, Mass.
McGregor, W., Pawtucket, R. I.
McKay, W. E., Boston, Mass.
Monks, R. J., Boston, Mass.
Morrison, H. K., Concord, N. H.
Neal, G. B., Charlestown, Mass.
Nettleton, C. H., Birmingham, Conn.
Norton, H. A., Boston, Mass.
Norton, W. F., Nashua, N. H.
Nute, J. E., Fall River, Mass.
Nutter, E. J., Milford, Mass.
Nutter, J. J., Milford, Mass.
Page, F. D., Fitchburg, Mass.
Parker, F. H., Burlington, Vt.
Prichard, C. F., Lynn, Mass.
Purinton, A. J., Waterbury, Conn.
Richardson, F. S., N. Adams, Mass.
Rossman, G. M., Keene, N. H.
Shelton, F. H., Chicago, Ills.
Sherman, F. C., New Haven, Conn.
Slater, A. B., Providence, R. I.
Snow, W. H., Holyoke, Mass.
Spaulding, C. F., Waltham, Mass.
Spaulding, C. S., Wakefield, Mass.
Spaulding, W. H., Clinton, Mass.
Spear, J. Q. A., Dorchester, Mass.
Stearns, W. M., Waltham, Mass.
Stratton, W. K., Haverhill, Mass.
Taber, R. B., Boston, Mass.
Tarbell, A. W., Waltham, Mass.
Terry, F. L., New London, Conn.
Thayer, W. F., Westfield, Mass.
Tilton, D. D., Newburyport, Mass.
Todd, J. R., Dedham, Mass.
Waldron, H. W., Portsmouth, N. H.
Waters, J. A., Stamford, Conn.
Wetherbee, G. E., Boston, Mass.
Wood, W. A., Boston, Mass.
Woodward, R., New Rochelle, N. Y.

Associate.

Addicks, F. P., Boston, Mass.
Alden, G. A., Watertown, Mass.
Allen, W. S., New Bedford, Mass.
Brown, F. H., Waltham, Mass.
Brown, A. P., Boston, Mass.
Coburn, C. M., Chelsea, Mass.
Cortis, D. T., Boston, Mass.
Davis, F. J., Waltham, Mass.
Hinman, C. W., Boston, Mass.
Holmes, R. E., Winsted, Conn.
McKenney, W. A., Boston, Mass.
Mace, F. W., Lynn, Mass.
Mason, V. W., Malden, Mass.
Pratt, F. S., Boston, Mass.
Sprague, P. W., Boston, Mass.
Thomas, F. W., Boston, Mass.
Tufts, J. P., Boston, Mass.
Waldo, J. A., Boston, Mass.
Wardwell, W. R., Boston, Mass.

APPOINTMENT OF SPECIAL COMMITTEES.

The President appointed the following special committees:

Committee on Nomination of Officers.—Messrs. C. D. Lamson, F. C. Sherman and H. A. Norton.

Committee on Reception of Visitors.—Messrs. A. B. Slater and John A. Coffin.

TELEGRAM CONGRATULATING THE MICHIGAN GAS ASSOCIATION.

On motion of Mr. John P. Harbison, the Secretary was instructed to send a telegram of congratulation to the Michigan Gas Association, then in annual session at Port Huron, Mich. The telegram subsequently sent by the Secretary, in accordance with the instruction, was as follows:

YOUNG'S HOTEL, BOSTON, Feb. 16, 1898.

Henry H. Hyde, Secretary Michigan Gas Association—Port Huron, Mich.—Telegram received. We congratulate you on your success, and assure you we feel a mother's delight in her vigorous offspring.

READING THE PAPERS.

The President introduced Mr. H. A. Allyn, of Cambridge, Mass., who read the following paper on

GASHOLDER CONSTRUCTION.

Mr. President and Gentlemen: My only excuse for inflicting a paper on the Association at this time is from the fact that your President and Secretary came to me, with tears in their eyes, and assured me that if I refused to come to the rescue the coming meeting would be a dead failure. I hardly knew whether to consider this a compliment, or to conclude that they had come to me, as a last resort, after appealing in vain to every other member of the Association. However, I concluded to give them the benefit of the doubt, hence the presentation of my paper to-day. I want to say, however, in passing, that it seems to me all wrong that an Association, having a membership of some 150, composed for the most part of young men, all actively engaged in the manufacture and sale of gas, should every year compel its officers to go among its members, coaxing for a sufficient number of papers to prevent our annual meeting from being a failure. I want to earnestly impress on the younger members the necessity of putting their shoulders to the wheel and aiding the officers of their choice in making the meetings of our Association instructive and profitable, and in maintaining our position among the Associations of the country.

When the executive officers of a gas company have decided, by reason of the increased output of gas, that the time has arrived when a new holder must be constructed, the first problem that naturally presents itself is, Of what capacity shall it be?

Perhaps my experience in endeavoring to solve this problem may aid others when in doubt. We have all heard various opinions expressed as to what relation the storage capacity of a works should bear to the maximum output of gas. These opinions differ so widely that one is led to agree with Josh Billings that "Circumstances alters cases." An expert, of whom I made the above inquiry, replied, "Build as large as your Directors are willing to pay for." Ten years ago the Cambridge Company had three holders of a combined capacity of 450,000 feet. The maximum output per 24 hours was 540,000 feet. After our Board had decided that a holder should be built, this question of capacity presented itself. It seemed to me that a holder of 500,000 feet would be about right, but I had doubts about bringing the Board to my way of thinking. Finally, it occurred to me that if I called for specifications of 400,000, 500,000 and 600,000 cu. feet respectively, the Directors might split the difference and give me the holder I desired. Much to my surprise, however, they voted unanimously for the 600,000 foot holder. On the completion of our new holder we felt that the building of another would be a long way in the future; but the Lord smiled upon us, and our output increased, from 114 million feet, in 1887, to 183 million feet, in 1895. So, in the fall of 1896 it was again deemed wise to construct another holder. The Board having decided to build an uncovered holder, with steel tank—matters which I will discuss later—the question of capacity again presented itself. I thought of my former experience and obtained specifications for holders of 1 million, 1½ million and 1¼ million feet respectively. Again our Board was liberal and voted for the 1¼ million holder, making the combined capacity of our five holders about 2½ million feet. As our maximum output for 24 hours during the present winter has been about 1 million feet, our present storage capacity therefore represents but little more than two days' supply, which, together with the fact that our output has increased, from 183 million in '95, to 223 million in '97, it would seem that we again erred in judgment in not building a holder of still greater capacity. Unless our Board decides to add a water gas apparatus to our plant, within five years we shall again be in need of increased storage capacity. In leaving this preliminary portion of my paper, to those in doubt as to how large a holder it will be expedient to recommend that their company should construct, I would again refer them to the opinion of my expert friend, "Build as large as your Directors are willing to pay for."

After deciding the question of capacity, the next problem that presents itself is: "Shall the holder be a covered one or not?" If the proposed holder is to be, we will say, of 100,000 feet capacity, there are some good points in favor of covering it. It will require less constant care during the winter months, and, being protected at all times from the action of the

elements, it can be kept in good condition at much less expense and will undoubtedly remain in a serviceable condition much longer than if it were uncovered.

With a larger holder, however, the case is different. The great expense involved in erecting a suitable holder house is so excessive that it seems the wiser course to devote the whole appropriation to the holder itself and dispense with the covering for the same. Though the holders at Cambridge are in a very exposed position, we have very little difficulty in keeping them in good working order during the winter months.

The next point for us to decide is whether our tank shall be constructed of brick and cement, of iron or steel, or a composite tank so called. Some form of steel or iron tank has become so popular the last few years that I predict that very few brick tanks will be constructed in the future. The freedom from care and anxiety alone, in constructing a steel tank, is almost sufficient to convert one in their favor. On the other hand, in building a brick tank of any considerable size, it is necessary to excavate to so great a depth, that water in large quantities is almost invariably met with, which must be removed at great expense. The engineer is fortunate indeed, if during the building of the tank some unpreventable or at least unforeseen accident does not occur which will greatly retard the completion of the work, or more serious still, leave him with a leaky tank when completed. In fact, of the large tanks completed during the last 20 years, I believe the perfectly tight tanks have been the exception rather than the rule.

Our choice is now narrowed down to choosing between a tank having steel sides and bottom, or a composite tank, having steel sides and brick or concrete bottom. I should be inclined to pass over this matter lightly, were it not for the fact that two gentlemen who have had tanks constructed for their companies on the composite plan during the past year are with us to-day, and should be amply able, and I have no doubt will be pleased to give you what they consider good and sufficient reasons why they decided to construct that style of tank.

I must confess that after listening to the arguments urged in favor of the composite tank, and giving the matter careful thought and consideration, the question narrowed down to this point: What will be gained, and what *may* be lost, by adopting this style of construction? We may save a few hundred dollars on the first cost of erection, but we may lose several thousand dollars if our tank proves to be leaky, or at any time should become so, to say nothing of the serious inconvenience that would be sure to result.

It seems to me that in constructing the gasholder, involving as it does a large expenditure of time and money, it is unwise to adopt one method of construction simply because it is a little cheaper than another. Our aim, I think, should be to have the work done in the best possible manner without regard to a slight saving in cost. It may be a mistaken opinion, but nevertheless I have a strong conviction that in uniting the steel and concrete the unequal expansion and contraction of the two materials may sooner or later develop leaks which may be difficult to remedy.

If in calling for bids for the construction of your holder you simply mention the capacity required, you will probably find, on receiving your specification, that the contractors have laid out a holder of small diameter and excessive height. In other words, it is much more economical for them to increase the height than the area; but as it is, I think, very desirable to keep the back pressure from your holder at a minimum figure, and at the same time to employ sufficient metal to insure stability, it is wise to plan for a tank of as large area as the space allotted to it will permit—I mean, of course, within reasonable bounds. The tank recently completed for our company is 153 feet in diameter and 31 feet deep. The holder has three lifts of about 30 feet each. Speaking of pressure, I was surprised, on the completion of our holder to find how closely the contractors had estimated the pressure that it would indicate. They estimated that the inner section would show 3.5 inches; it gave 3.6 inches. Estimate for middle and first sections, 5.1 inches; it gave 5.3 inches. The estimated pressure for the three sections was 6.5 inches, which was correct. If you will pardon me I will offer a few suggestions to those contemplating the erection of a holder. Before getting down to business, request one of the contractors whom you intend to invite to bid for the job to loan you the specifications of some holder which they have constructed, of about the capacity of that which your company has decided to build. This will furnish a starting point. Commence at the crown sheet and carefully consider the merits of every piece of metal incorporated in the specifications, whether sheet, angle iron or rivet. As you pass from one detail to another, many desirable changes will doubtless suggest themselves, which if incorporated in your final specifications will insure the construction of a substantial and serviceable piece of apparatus. Having decided on the contractors whom you will invite to compete for the contract, request them to prepare plans and specifications in accord with the conclusions you have reached. State the gauge of iron required for the different courses of the crown and for the shells of each section, also for the sheets for the cups and grips. It will be desirable also to mention approximately the diameter of the tank required. By doing this preliminary work the necessity for returning the specifications for revision will be avoided, and will not only please the contractors, but will expedite matters greatly. Again, when the competing contractors have submitted their plans and specifications, you will doubtless compare each with the others, checking off and making a note of the weight, thickness and measurements of each piece of metal employed. By following this method of comparison you will quickly reach a conclusion which contractor proposes to give you the best return for your money.

Having reached this stage of our work we naturally make an investigation to determine the nature of the soil on which our holder is to be erected, in order to determine what material will be most suitable for a foundation to support the weight which will be placed upon it. As almost every locality selected presents some features peculiar to itself, I will simply state our experience and the means adopted to secure a reliable foundation.

The land on which our holder was to be erected was formerly a salt marsh, the average level of which was some 4 feet below the grade of the street. This space had been filled with debris of various kinds. Removing this material, we found meadow peat, for a depth of from 3 to 4 feet, and below this a natural deposit of sand of an average depth of 3½ feet, and, finally, a bed of blue clay of unknown depth. The strata of sand was saturated with water to within about 1½ feet of its surface. We had now to decide whether to remove all of the sand down to the clay, and cover the latter with a layer of concrete of sufficient depth to support the tank at the desired level, or to simply level the surface of the sand, draw the water down in the latter by means of a circular drain and well, and cover the sand with a substantial layer of concrete. While the first method would perhaps appear less liable to result in failure, yet the great difference in the quantity of concrete required, and from the fact that I have always entertained a good opinion of the stability of sand when brought under proper control, I decided to take the latter course.

I next debated the question of what grade of cement it was advisable to employ in our concrete; whether Rosendale, German, English or American Portland. My preference seemed to be between the German and English; but as the Chair was still in doubt, I concluded to ask the opinion of the Assistant City Engineer, of Boston. His opinion, briefly, was this: "Many will claim that the Rosendale will answer the purpose just as well, and at a great deal less cost; but it is admitted that the German cement is the best made. In an expensive undertaking like this, you can't afford to take any chances. Simply get the best." I concluded to listen to his words of wisdom, and decided in favor of Lagerdorfer cement.

Our concrete was composed of 2 parts of cement, 6 parts of sand and 12 parts of cracked stone. We, first, had a belt of concrete, 2½ feet thick and 7½ feet wide, around the circle to be covered by the tank, with a projection of 4 feet outside of the same. The remainder of the area occupied by the tank was covered with a layer of concrete 18 inches in thickness. On the projection alluded to a low retaining wall is built, 2 feet distant from the tank, to allow of easy access to the sides of the same for the purpose of painting or other repairs. The retaining wall also prevents the earth from coming in contact with the surface of the tank, and will serve as a support for the steam heating pipes; 1,427 barrels of cement and about 1,500 tons of cracked stone were required for the concrete, together with the sand, which we obtained from our excavation.

I fear I have made my story altogether too long. I will, therefore, pass over the other details of construction, and simply mention one point which may prove of interest. For our inlet and outlet connections we devised a scheme which, as far as I am aware, has not been employed in any other holder in this vicinity. Having during the past 25 years, on more than one occasion, experienced some little difficulty in putting gas in, and also in getting it out of, our holders, by reason of the accumulation in the connections of a substance of which some of you may have heard, it occurred to me that it would be a good thing to have three connections instead of two, one of these to be used in an emergency, either as an inlet or an outlet.

This connection enters the tank at the valve or governor house. One-quarter way around the tank the regular inlet is located, and directly opposite, and about 130 feet distant from the latter, is the outlet. The

inlet and outlet pipes are carried around the tank to the valve house, where they are connected with the auxiliary pipe. By manipulating the valves, the gas may be sent through the regular inlet and outlet, or, in case of the stoppage of either, through the third connection. As an additional safeguard we have introduced a steam pipe at the inlet drip, which passes along the bottom of the main to the footbend inside the tank. In case of a collection of naphthaline, we think this device will be found useful. It is said that "Eternal vigilance is the price of liberty." By slightly changing this maxim to "Eternal vigilance is the price of perfect gasholder," we have a saying that is applicable to our case. From the day of the receipt of the specifications to the completion of the contract, the utmost vigilance is required to insure the desired results. The contractors may be in the front rank in their line, and will undoubtedly intend to fulfill their contract to the letter, and give you a holder that shall be an honor to them and a joy forever to you; but, with a gang of perhaps 100 men, picked up at random, a strong hand and watchful eye will be required to insure the hoped-for result.

[Having concluded the paper proper Mr. Allyn, with the aid of two large diagrams, illustrated the two methods of constructing the foundations, which method of construction is shown in Mr. W. A. Learned's part (subsequently reported) in the discussion on Mr. Allyn's paper.]

Discussion.

The President—If our papers continue to be in character like that just read, I have no question that we shall gather a great deal of useful information from them and from their discussion. Many of our members are very much interested in this matter of holder construction, for some of them have lately erected holders. I have personally never had anything to do with holder construction, but I shall be very glad if the members will discuss the matter. Has not Mr. Harbison something to say on the subject?

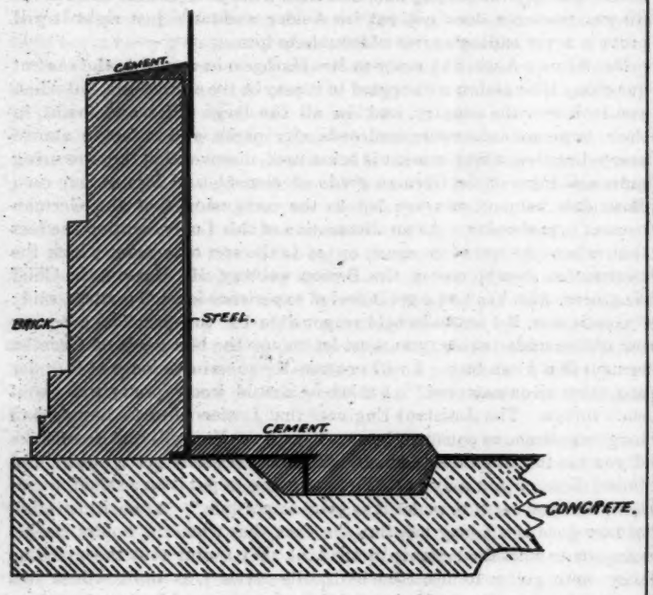
Mr. Harbison—I have had some experience in the construction of holders and holder tanks, and within the last few years we have built an additional holder. It is a 3-lift holder in a steel tank. We put the tank 10 feet below the surface of the ground, and 20 feet above. It is a combination tank and holder. We did not leave any space between the brickwork and the steel tank in which to support steam pipes, for I do not know why steam pipes are wanted down there. We built it with a 3-foot wall at the bottom, and 2 feet at the top, with 10 feet of height around the tank—as a support, perhaps, for our neighbors' land who might possibly in excavating go pretty close to the boundary line. I do not know why it is necessary for an American gas engineer to go to Germany for his cement; I did not find it necessary. We use the Rosendale cement with perfect success. We get clean sharp sand to mix with it, and used good, clean, trap rock, broken to the proper size to make our concrete. We have had perfect success with this in the outcome. I would like to have the New England Association, and any gentlemen who are visiting us, look at our holder and tank. We are rather proud of it. I do not agree with Mr. Allyn that it is well for a gas engineer to dictate very much to the gasholder constructors, as to the grades of iron or steel which shall be used, because we suppose, and properly suppose as I think, that a concern which is engaged in building gasholders has an engineer in its employ who is better fitted by experience to determine what is the best grade and number of iron to be used rather than is the manager of the gas works. If he invites bids he will have from their specifications an aggregation of information such as he may not originally have had at his service. If you suggest to them the lines they shall work on they will of course work on those lines. So I prefer to let the various parties who want to build the holder send in their specifications; then if I have any knowledge on the subject I can compare them and make up my mind what we had better have. The holder which we built within a couple of years has a capacity of about 600,000 cubic feet, and is exceedingly satisfac tory. It is not covered—none of our holders are covered. In the severest storms we have not seen any perceptible variation in the movement of the holder. The construction of a holder is of course a very important thing, but the care of that holder afterwards is also very important. Continual care must be given to that, as well as to other departments of work. First of all you should have a reputable concern to deal with; and, as has been well suggested by Mr. Allyn, you must yourself be pretty active during the entire construction of the work, from the digging of the pit (if you do any excavating) to the painting of the holder. You must also be a little bit particular when the holder is being painted to see that all the nuts, bolts and rivets are properly covered, to see that the men do their work thoroughly, and that every part of it is covered. If not, rust will soon form and injure your holder. We formerly had all our holder tanks built with brick. In Hartford we have a difference of about 27 feet between high and low water mark—a little bagatelle which we have to contend with occasionally and somewhat regularly. Formerly we built brick tanks, but as in every case they leaked we had to put in steel linings, and have done so in all our tanks—years after they were built. In putting in the steel linings we leave perhaps an inch space between the brickwork and the outer steel lining, filling in with concrete, thus making it tight. We now have tights tanks throughout our works. Our five holder tanks are (or as nearly so as they can be made) absolutely tight. Evaporation renders it necessary to occasionally put in a little water. It is a great comfort to us to have them as they are. I advocate the steel tank and a good holder, and doing the work as well as it can be done. A feature which some of the members may have not taken into account, but which I deem a most important one, is the necessity of having the holder and tank regularly inspected in every detail—just as we inspect all other parts of our work. It should be carefully examined by some one who will make a report to you in writing at stated times, if you do not do it yourself. Then you know that there is nothing out of order. If he finds anything which is likely to make trouble it is at once attended to. If examined in the daytime, and there is anything that needs attention you have time during the day to attend to it. Mr. Allyn's paper is an exceedingly interesting one, and is on a very important subject. If the gas manager does not get his holder and tank just right it will prove a never ending source of trouble to him.

Mr. Allyn—A word in reply to Mr. Harbison in regard to the cement question. His opinion with regard to it may be the correct one, but when you look over the country, and, in all the large cities and towns, in their large manufactories, railroads, city parks, and in fact in almost every direction where cement is being used, discover that they are using more and more of the German grade of cement, and less of our own Rosendale cement, you are led to the conclusion that the German cement is preferable. As an illustration of this I may mention the fact that, when the question came up as to the sort of cement which the contractors should use in the Boston subway, Mr. Carson, the Chief Engineer, who has had a great deal of experience in such matters, said: "Gentlemen, if I am to be held responsible for the practical carrying out of this undertaking, you must let me use the best grade of German cement that I can buy. I will not take the superintendence of it under any other circumstances." I think he should know pretty well about such things. The Assistant Engineer that I referred to as having had long experience in construction work, said: "You will make a mistake if you use the Rosendale cement. You may possibly get a substantial foundation, or you may not. You are going to put it on a sand foundation, and you want to make it as good as possible." As an illustration of how good it is I may mention the fact that when the holder people came on to start the riveting of the tank they found that the machine they were going to use (the hydraulic riveter), as built, would just scrape along on the projections of the concrete; and it seemed to them desirable to pick a little around outside so as to allow the riveter to swing clear. The Superintendent told his men to get some picks. I watched the result. They picked away for about half an hour, but as they did not succeed in getting down half an inch the Superintendent concluded he would not do any more picking there. That concrete had then only been in about two weeks. It seemed to be as solid and hard as a block of granite would be. In regard to dictating to the contractors I may have a mistaken idea, but I think my Company employ me because they think I have got some brains and know a little something about the business and the requirements of it. And while undoubtedly the contractors doing this kind of work all the time may have a great deal more knowledge of it than I have, yet I think from year to year I discover places where they might have made a great deal of improvement. For instance, I have one holder which is in perfect shape in every way and manner, except in one instance, and that is in the cup sheet. The drip of the cups is made of the same identical thickness and gauge of iron as the rest of the shell—about a sixteenth of an inch thick. It was built by one of the leading contractors of the country, and he simply skinned on these cup and drip sheets in order to be able to figure the price of the holder a little lower. Now we have to let our holder down and remove all those cup drips and sheets, which would not have to be done now had the work been properly done in the first place.

The President—I think that Mr. Learned can contribute something to this discussion.

Mr. W. A. Learned—I am one of the gentlemen named in the paper who had the audacity to put in a combination tank, and as Mr. Allyn very kindly gave me in advance that portion of his paper relating to that tank, I was enabled to prepare the following reply: The size of the holder is 700,000 cubic feet capacity, and it has three lifts. The tank is

103 feet in diameter, and the total height is 133 feet. It is located on a side hill, within 9 feet of an existing holder. The test pit showed a high ground water level. On the south side hardpan was encountered 5 feet below the surface, and on the north side the depth was 10 feet. There was a layer of muck 2½ feet thick above the hardpan. All excavations were made to hardpan, and the north side of the foundation was filled up 6 feet, in layers 4 inches deep, and rolled by horse power. The south side was filled 1 foot above hardpan, so that the foundation would not rest on hardpan on one side and on 5 feet filling on the other. The foundation was made of concrete, in the proportion of one part cement, two of sand and three of stone. It was 20 inches thick in center and 24 inches on sides. All cements were tested, the common cement showing 90 pounds tensile strength on 24-hour test, and 11 per cent coarseness, passing through a 100-mesh sieve. Portland cement showed tensile strength of 226 pounds per square inch and 17 per cent. coarseness. Preference was given to a coarse Portland cement when used neat, but with a mixture of sand the finest cement is the best. It is my opinion that the commercial value of all cements should be based on the quantity of pure cement in the barrel, as determined by the mesh test. After the iron tank work was completed the joint was made. I show you a sketch of the construction of the joint. Mr. Allyn says he



has a strong conviction that the steel and Portland cement will cause leaks by unequal expansion. It is a well known fact that the coefficient of expansion of Portland cement and steel or iron is approximately the same. There is no material change if the mixture contains one to three parts of sand. By the insertion of a horizontal plate at the lower edge of the tank shell the tensile resistance of the cement is greatly increased. The surfaces unite both chemically and mechanically. The force of adhesion amounts to 300 pounds per square inch of surface. These properties have been applied to bridge construction of as much as 100 feet span, consisting of a concrete arch, in which is located a network of iron rods tied together at the intersection with steel wires. It is necessary to provide a foundation to support the load in either case. The reliance upon the steel bottom to assist the concrete in giving additional strength is erroneous. With a view to strengthen the concrete bottom, the steel sheets should be located below the concrete and not on the top. A settlement of the ground would carry with it the concrete bottom and probably fracture the same. The steel bottom would be depressed in the same ratio, straining the joints and causing leaks. The water would have to be removed in either case. If a depression occurred near the tank shell it is possible that the weight of the water upon the steel sheets in the tank will affect the tank shell, causing a distortion of the same and forcing the guide frames out of plumb. One of the principal objections to the steel bottom is the possibility of oxidation on the under side of the plate. There is no deterioration on the inner surface of the plate by oxidation, as the exposure to the action of the water takes place under a uniform pressure and unchanging condition. The action of the atmosphere on the under plates cannot be prevented, as it is impossible to exclude the same, even with the most careful grouting with Portland cement, for the reason that after the evaporation of the water there is sufficient shrinkage to permit the air to circulate under the plates. There is no doubt in my mind that many steel bottoms will become leaky in the future, and the remedy would be to place a new concrete bottom on top of the same. If this is the only remedy for the destroyed steel plates they had better be omitted in the original construction. The construction of the combination tank is so superior to an all steel tank that the question of cost ought not to enter into the consideration, although in my case there was a marked saving.

Mr. Prichard—I might say that the tank which we built this year was substantially of the same design. When we considered the question of using cheaper cement we made a calculation and found that the difference in cost would be only about $500, which was a very small percentage of the total cost. As we concluded that the best was none too good for us, we decided to use the best Portland cement. In the original design the cap was made of stone. We feared water would gradually get between the stone and iron and cause corrosion, so adopted the plan of attaching an iron plate curb to the holder, leaving no possible joint to open. The conditions we had to meet were 4 feet in height of peat, under which was sand. The tide rising about 10 feet above the bottom of the holder, and the fact that the tank was within a very short distance of the salt water—in fact at the last storm the water came up to within a few feet of the tank—we feared that if the salt water got in under the bottom we would soon loose our tank. Our idea was to reduce the liability to be exposed to salt water to the smallest possible point, and we did it by putting in this brick wall and carefully grouting every possible joint, and using a cement bottom, so that there seems to be no possibility of any water coming in contact with the iron of the holder from the outside. It is needless to say that the tank is tight, and has been so from the very first. Some additional precautions were taken to make it secure, but as most of those present know of them it is needless to speak of them here.

Mr. Allyn—You will notice from the remarks of our Secretary that even he sometimes has the temerity to differ with contractors in their ideas of how things should be made. My idea was, when I had written the paper, that the construction was as he had expected, and I could see no reason why the moisture came down in there, although I knew, on account of the unequal expansion of the brickwork, a tank would sooner or later develop a source of weakness in there. I think Mr. Prichard will bear me out in saying (as he is in the electrical business) that when trolley poles are taken down, although they have been in the ground only a very few years, and are encased in Portland cement concrete, it is the fact that they are often eaten more than half way through at the ground level, where the moisture runs down and gradually oxidizes the surface of the iron.

Mr. Harbison—It is not at all necessary to examine trolley poles to get at that result. Almost anything between wind and water will wear out, whether it be of iron or wood. Mr. Allyn alludes to the remark I made about depending on the experience of engineers of constructing parties in determining the weight and grade of iron to be used in a holder. I do not do that, but I invite their suggestions and then decide for myself.

Mr. Allyn—That is exactly what I said in my paper. I requested specifications from contractors, and then profited by their experience.

Mr. Harbison—Our tank was not constructed with a steel bottom, for I do not believe in that form of construction; I believe in having a concrete bottom. On the question of cement, let me say if you buy fresh Rosendale cement that will set under water you cannot in my opinion improve on it with anything else. If you get a cement which will set under water, that is just what you need. And when you dull a steel pick in breaking up a piece of concrete you may know that you have got a pretty good article. I have within the past 30 days had occasion to dig into a wall built three years ago, to cut holes for floor beams where we have been making some changes in our water gas plant. I have some pieces of brick and cement cut out of that wall, that I would be glad to show. I preserved them as specimens. We make pretty good brick in the vicinity of Hartford, for we have fine brick clay, and in nine cases out of ten you will find that you cannot separate the cement from the brick; and any attempt to clean the brick will be a wearisome job. If you use that sort of cement and sand in making concrete you will have it pretty tight. When we put on the concrete bottom, before turning on the water, we laid a course of brick all over the bottom, and put a coat of cement mortar over that, finishing it off with a bricklayer's finishing trowel, and so made a perfectly smooth surface, and a perfectly tight tank.

Mr. Shelton—I think it is time for something to be said for those who prefer the old-fashioned plan of steel tank construction, and not the

composite construction. I want to emphasize the remark in Mr. Allyn's paper where he says that he has a high regard for the stability of sand when under proper control. I know that we have very ancient authority for the statement that a structure built on sand cannot be depended upon; but we are aware that in that case the sand was capable of being washed away. The maxim does not necessarily apply to sand that cannot be washed away. I have found it extremely dependable and a very cheap mean for accomplishing certain objects. A gas company may invite bids for the construction of a small steel tank holder, estimating that it should cost a certain sum only to realize very quickly that they have to provide a pancake of concrete which will cost $1,000, $2,000, perhaps $3,000, which must be added to the holder cost; and this is quite an item to a great many companies. Two years ago I had the supervision of a gas plant erecting at Tampa, Florida. As you all know in Florida stone is very scarce while sand is not; practically Florida is all sand. The question of the expense of a concrete bottom for a steel tank about to be constructed was quite an important one. The cost of the stone for the concrete was considerable, as well as the concrete itself, as the haul to Florida is a long one. Therefore it was resolved to use a sand instead of the ordinary concrete bottom. First, a masonry ring was constructed about 2 feet deep, and about 2 feet high, which was simply a retaining wall. Then the area enclosed by that ring was filled in with sand, which was to be had for the taking at a distance of a few feet the other side of the wall. That was flushed with water, and as it was filled in it was rammed, and it was absolutely solid. You cannot compress sand, and if you enclose it so that it cannot run away you have then a structure which will last practically for all time. One of the provisions to be made is to keep surface water from eroding the sand or washing it away. If the retaining wall is laid up with concrete mortar, and if the location of the holder is such that it is not subject to the action of any water excepting surface water (which can be kept out by the brick wall, and laid away by ordinary drainage) then you have a cheap way of building, and one which is very suitable in many instances. Where so used there should be a top dressing of one course of brick to stand the wear of handling the plates during erection. I might say that I would not in the least recommend the substitution of sand in all cases or use sand in the instances described by Mr. Prichard—where water is liable to come in contact with it through the bottom. But there are many parts of the country where the works are constructed on comparatively dry land, and where there is no possible danger of the water getting through the outside retaining wall; and at such points a tidy sum can be safely saved, in the construction of tanks, by substituting sand enclosed within a brick wall as described. Of course this method of construction need not be confined to holders; it is applicable to cheese-box oil tanks, which are very commonly used in gasworks nowadays; and where in fact the proportion of cost of concrete work to iron work is greater than in the case of holders. In such cases the scheme can be used to advantage that I have suggested. Sand, not confined, is a master; confined, it is a good servant.

Mr. Sherman—We had an experience with a brick tank which did not cause us to have much faith in building on sand. The city built a sewer, the line of which went below our tank, which rested on sand. The resulting disturbance almost ruined our tank.

The President—We would like to hear from Mr. Mayer on this subject.

Mr. Mayer—I hardly think it fair to take part in this discussion, being the originator of the new construction; but I wish to state that I do not entirely agree with Mr. Allyn's method of deciding upon the quality of the different constructions, simply by reading different specifications and then comparing same. This method, in my opinion, simply determines the question as to the amount of material contained in the various propositions. In other words, it only determines which proposal contains the greatest number of pounds for a certain amount of money, but it does not determine the more important and vital question as to which construction offers the greatest strength or resistance for the same amount of money. If anything is required from the contractors to be submitted, upon which the decision as to the quality of the construction can be made, I think it would require the submission of detail, statical calculations of strains both for the guide frame and holder, and in fact for every other detail connected with the construction. If such calculation is submitted to capable and careful engineers, the question can easily be determined as to which construction is the best and cheapest, irrespective of the cost. With regard to the future of the combination tank, I may say I feel satisfied for many reasons, most of which have been explained by Mr. Learned, that such tanks will be constructed not only with reference to their bottoms, but that the shells or sides may also be constructed with cement in combination with steel or iron ribs.

The President—Do you believe those tanks should be built with cement sides?

Mr. Mayer—Yes.

The President—That is, there will be no plate in the tank except to make the ribs?

Mr. Mayer—Yes.

The President—But otherwise, no plate in the tank?

Mr. Mayer—No flat plates in the tank shells. I think it possible that such constructions can be arranged, and believe it likely that some tanks will be so arranged in the future. I consider such construction a very important step towards progress. We all know that cement is of a very brittle character and offers resistance to compression only, and that when treated as a beam supported at both ends the ultimate load will result in fracture the moment that the limit of tensional resistance has been reached. Now, if by the insertion of iron rods under proper conditions, and in the proper location, cement can be made elastic, we overcome this liability of fracture upon reaching the limit of tensional resistance. This construction was originally invented by a gardener in France, named Monier, who attempted to make large vessels to contain earth for the planting of flowers. He made them of cement and they burst from the internal pressure of the earth. He then applied a network of wire in the center of the cement, after which they resisted the pressure. This accidental construction, as I may call it, was taken up by German engineers, who carried the same to such an extent of perfection that now bridges are constructed entirely of cement, with the insertion of a network of steel rods located a certain distance from the neutral line, so as to be capable of resisting the tensional strains, the total amount of which is depending upon the span of the bridge. I have seen a bridge with a span of 130 feet, in which the thickness in center of arch was not over 6 inches. This same bridge, constructed of solid masonry in the ordinary manner, would have a thickness of from 3 to 4 feet. There are no fractures in this construction, notwithstanding the fact that for many years heavy loads have been passing over it. This is simply due to the conversion of the character of the cement so as to resist tensional strains, thus making the arch elastic by the introduction of the steel rods. I believe similar methods can be applied in the construction of gasholder tanks.

Mr. J. J. Humphreys—By a number of tests made some time ago of brick and cement I ascertained that the Rosendale cement gave 920 and the Portland gave 960.

The President—Was it clear cement in both cases?

Mr. J. J. Humphreys—Clear cement which had been in water for a month and then laid aside. It was nine months old when the tests were made.

The President—My impression is that with Portland cement a larger proportion of sand must be used, so that when you make the concrete there is not very much difference in cost.

Mr. Prichard—I notice that Mr. Allyn, in speaking of the bids of various contractors, said they seemed to desire to bid on holders of smaller diameter and greater height on account of economy. I also gathered from what Mr. Mayer said they do so because they consider it better engineering. Does Mr. Mayer consider that a holder of smaller diameter, the contents being made up by extra height, can be built cheaper; and also whether he thinks it is more suitable for withstanding wind pressure?

Mr. Mayer—As far as wind pressure is concerned, both structures would have the same resistance by adopting in either case a calculation of strains containing the same factors of wind velocity, pressures, etc. As to cheapness of construction the higher holder is preferable in many instances.

Mr. Prichard—Is not a tall holder better adapted to withstand wind pressure?

Mr. Mayer—I cannot say it would be, because the construction of the holder in either case should be such as to resist the wind pressure with the same fiber strains of the material; and I cannot say that one construction is stronger than the other when both have been adapted to the same resistances.

Mr. Prichard—That is not quite the idea I want to get at. Suppose they were not figuring them to be of equal strength, but they were built of the same material exactly, one being of smaller diameter and taller, the other being of larger diameter and proportionately flat, would not the tall one be the stronger holder, if built out of exactly the same material?

Mr. Mayer—I do not like to answer that question exactly in that way. They would not be constructed of the same material because the conditions

which control the determination of cross-sectional dimensions of the material are very different; and it would not be a proper construction to apply the same thickness of material to both holders. But where the materials have been properly adapted to the peculiar requirements in each case, the ability to resist the strains is absolutely the same in both.

The President—Is not that true within certain limits? Take for instance a tank and holder of the same height; that is practically the cheapest form of construction, is it not? I mean, taking the same number of lifts, that must be about the basis. The holders that these gentlemen have are ordinarily about as far from the top of the tank to the top of the upper lift, when the vessel is full, as in diameter.

Mr. Mayer—Under ordinary circumstances that would be the best way of building—with the diameter of tank about equal to that of the entire height; but local conditions often require entirely different proportions. The principal objection to the tall holder is the great variation in pressure between the inner sections and when the entire holder is entirely inflated.

The President—In the 6-lift holders built abroad, notably of the type erected by the South Metropolitan Gas Company, of London, in which the two upper lifts are out of the frame, there must be an enormous difference in the pressure.

Mr. Mayer—Those holders are about 250 feet diamer, and as the axis is only about 30 feet high, the proportion between the diameter and the height is not very different from what we ordinarily have.

Mr. Ramsdell—Regarding one mention made by Mr. Prichard. Recently, in getting prices on some holder work, I found that a 2-lift holder of 300,000 feet capacity cost practically the same as a 3-lift holder of 400,000 capacity, by reason of the saving in tank as compared to the cost of the third lift.

Mr. Sherman—The time is coming when most of us will have to revise essentially our thought as to the proportion of holder room to our sendout. The old formula is that we should have a holder capacity sufficient for one night's consumption, or 24 hours. The increased day consumption we are all having at the present time has caused that formula to become obsolete. It certainly is with us in New Haven. We have had no difficulty this winter in sending out almost twice our holder capacity, and have had no inconvenience in doing it. Under the old formula we would have had to double up. In other words, with a manufacturing capacity of 750,000 cubic feet, we have had no trouble whatever in sending out 1,300,000 cubic feet. The condition is in our day consumption—I may say that one-third of our sendout is in the daytime.

The President—What hours do you call the daytime?

Mr. Sherman—From 7 o'clock, A.M. until 4 o'clock, P.M., in the winter time; and from 6 to 6 o'clock in summer.

The President—All last summer one-third of the output of the Spring field Company was between 7 A.M. and 3 P.M.; and now it is not quite one-fourth between those hours, as we ordinarily run.

Mr. Addicks—What kind of gas does Mr. Sherman make—the question being put as to determining whether the sort of gas made has any influence on holder capacity?

Mr. Sherman—We are making 22-candle gas, one-half water and one-half coal gas. I do not see your point with regard to the holder capacity.

Mr. Addicks—It is simply the question whether a water gas plant enables you to have smaller holder capacity.

The President—I think I am right in saying that Mr. Sherman runs his water gas plant almost as he does his coal gas plant, and gets a continuous output from the two during the whole 24 hours.

Mr. Sherman—That is right.

The President—Many of us run our water gas plants as Mr. Addicks suggests; that is, we run the coal gas plant to a certain amount, and the other quantity needed is made in the water gas plant—making more or less as may be required; but that is not the case with Mr. Sherman. The utilization of his water gas plant has nothing whatever to do with his holder capacity. And here comes up something I would like to speak of concerning holder capacity. Some years ago the Springfield Company sent out about 460,000 feet during a certain 24 hours, and during that 24 hours there was only a variation in the quantity of gas in the holders of 65,000 feet—which I think was a very remarkable thing. It seems strange to me there should be so little variation.

Mr. Addicks—I would like further to explain my question as to a continuous run. While a continuous run is advantageous—and I congratulate Mr. Sherman that he is able to have it—I think he may have some comfort in feeling that, if required, he still has in reserve something which will enable him to obtain an additional supply, for then, in case of a stoppage or lack of gas, he might readily make up lost time.

Mr. Wood—I would like to ask Mr. Allyn regarding the concrete bottom he spoke of, and as to the outside layer of the circle being much thicker than the center. Would that outside circle carry down to the clay?

Mr. Allyn—No; that is on the sand. I think there is a depth of about 18 inches of sand under that portion of it.

Mr. McKay—I would like to ask Mr. Allyn if he has noted the effect of the wind on the holder pressure. When the recent blizzard swept over new England we noticed that our holder pressure fell from 4 6 to less than 4.4, due entirely to the wind. If Mr. Allyn happened to observe his holder, I would like to know how much reduction he found.

Mr. Allyn—We have not noticed that. The holder which is directly on the opposite side of the street might have helped to equalize the pressure, as that is sheltered somewhat from the wind. The two working together might have helped to offset the difference that Mr. McKay speaks of.

On motion of Mr. Harbison a vote of thanks was tendered to Mr. Allyn for his very interesting paper.

CONGRATULATIONS FROM THE MICHIGAN GAS ASSOCIATION.

The Secretary read the following telegram:

PORT HURON, MICH., Feb. 16, 1898.

To the New England Association of Gas Engineers: The Michigan congratulates the Mother Association on having attained her 28th anniversary, and wishes her a long life and a prosperous one.

HENRY A. HYDE, Secretary."

On motion, a recess until 2:30 P.M. was ordered.

[To be Continued.]

ABSTRACT OF PROCEEDINGS, FIFTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

HELD AT HOTEL HARRINGTON, PORT HURON, MICH., FEB. 16 AND 17, 1898.

FIRST DAY—MORNING SESSION.

The meeting was called to order at 10:40 A.M., Feb. 16, in Parlor B, Hotel Harrington, by the President, Mr. Henry W. Douglas, of Ann Arbor, Mich. The following members responded to

ROLL CALL.

Honorary.

E. P. Callender.

Active.

Baxter, Isaac C.	Gallagher, E. F.	Morgans, W. H.
Bostwick, W. J.	Guitteau, T. B.	Neuendorf, Charles.
Calhoun, Robt.	Hess, Frank H.	Raynor, C. H.
Douglas, Henry W.	Howden, J. J.	Sterling, J. C.
Dole, S. Milo.	Hyde, H. H.	Walker, Joseph W.
Dean, Sedgwick.	Knight, John J.	Walker, L. E.
Elles, Edward J.	Lynn, J. T.	Wolff, S. E.
Eaton, W. M.	Latta, L. M.	Zwisler, A. L.
Freese, F. W.		

Associate.

Bonney, W. P.	Dwyer, F. T.	Van Wie, E. G.
Cressler, A. D.	Harper, H. D.	Wickham, Leigh.
Corbus, F. G.	Persons, F. R.	

A motion to omit the reading of the minutes of the last annual meeting was carried. The following

REPORT FROM THE EXECUTIVE COMMITTEE

was then read:

PORT HURON, MICH., February 15, 1898.

To the Members of the Michigan Association: Your Committee has to recommend the following names for membership in this Association:

Active.

Begole, C. M., Director Flint Gas Light Company.
Dawes, B. G., President Lansing Gas Light Company.
Dykeman, J. H., Supt. Port Huron Lighting and Heating Company.
Lynn, John R., Supt. Benton Harbor and St. Joseph Gas Company.
Wells, C. R., President Bay City Gas Light Company.

Associate.

Cunningham, J. R., Salesman, Schneider & Trenkamp Co., Cleveland, O.

Eaton, A. B., Western Sales Agent, U. G. I. Co., Chicago, Ills.

Gale, A. S., Salesman Standard Lighting Co., Cleveland, O.

Hoagland, A. H., Rep. Welsbach Street Lighting Co.

Holmes, F., Salesman, A. J. Linderman & Hoverson Co., Milwaukee, Wis.

Lloyd, E. F., Sec., W. G. Construction Co., Fort Wayne, Ind.

Luce, W. A., Sec., Youghiogheny River Coal Co., Erie, Pa.

Lynch, G. W., Salesman, Detroit Meter Co., Detroit, Mich.

Thompson, J. H., Representing Elec. Gas Stove Co., Detroit, Mich.

For Nominating Committee the following gentlemen are recommended: Messrs. Isaac C. Baxter, John J. Knight and L. M. Latta.

We have to present to you for consideration the following papers:

"Experiments with the Welsbach Lamp," by Mr. Frank H. Hess.

"Our Patrons: How to Treat Them," by Mr. S. Milo Dole.

"The Utilization of Coal Tar by Distillation," by Mr. Edward J. Elles.

"An Automatic Closed Purifier," by Mr. Henry G. Beatley.

"Reminiscences," by Mr. Robert Calhoun.

This Committee recommends the following amendments to the Constitution:

1. In first line of Section 8, by adding the words "and associate" after the word active.

2. Section 10 to read as follows: "Active and associate members shall pay an initiation fee of two dollars (which shall include one year's dues) at the meeting at which they are elected, and dues thereafter in the sum of two dollars annually, which shall be paid in advance."

3. To amend Sec. 22 to read as follows: "The annual meeting of the Association shall be held on the third Wednesday and Thursday after the first Monday in February of each year."

Respectfully submitted,

H. W. Douglas,
C. H. Raynor,
W. M. Eaton,
} Executive Committee.

The reading of the report was followed by a lengthy and lively discussion on the subject of changing the date of the annual meeting, not only as to the change of day of month as suggested in the report, but also as to advisability of changing the month from February to August or September. It was eventually shown that as the Committee's recommendations were in line with the action proposed at the last annual meeting, any change to be made therein at this time, to have the same comply with the requirements of the Constitution, would put the entire matter over to next year; therefore, it was decided to adopt the report of the Committee in its entirety, as given above.

Reports of Secretary and Treasurer.

Secretary-Treasurer Hyde, as Secretary, reported that, for year ended Feb. 14, there were on the membership rolls 2 Honorary, 48 Active and 28 Associate members, representing 28 of the 37 reporting Companies in the State. There were 8 Association badges on hand. As Treasurer, Mr. Hyde reported total receipts for the year ended Feb. 14, $104, an expenditure of $52.20, and a balance of $51.80.

President Douglas then read the following

INAUGURAL ADDRESS.

Gentlemen of the Michigan Gas Association:

This year the Michigan Gas Association begins the sixth year of its successful existence. Five years ago, in response to circular letters sent out by Mr. Walbridge and myself, some 12 delegates of the gas companies of this State assembled at Kalamazoo and organized an Association which had for its aim, not the particular advancement of the science of gas engineering nor the gathering together for banquets and entertainments, but for the presentation of matters which were of current and of practical interest to the gas companies of this State, and for their free and informal discussion. It was urged by some that there were already many similar Associations in the field, and that we would be more benefited by affiliating ourselves with one or the other of these; for in such Associations we would come in contact with the greater lights of our profession, and be able to hear discussed papers of far more importance than any which would emanate from our humble selves.

I think that the success of this Association fully demonstrates that there is room for us, composed as is our body of representatives of the smaller sized companies. Subjects which are presented by the engineers of great gas undertakings, which are no doubt of interest to us, have very little practical bearing on the everyday workings of our plants. What we needed was to get acquainted, to be able to compare our results, and to ask questions which would be considered in the large Associations too simple to need an answer. In this end we have certainly been successful, and I trust that our meetings will always be conducted in the free and open manner which has characterized them in the past.

Each year the matter of having a stenographic report of our discussions and papers has come up, and I think rightly we have decided that it would be of little benefit and undesirable. The plan of having printed the papers, to be read and distributed in advance of the meeting would, in my mind be of great advantage, and aid in their intelligent discussion and understanding. Many facts and figures are presented in papers which it is impossible to keep in mind until the meeting is finished, and it is often on just such facts that questions and criticisms would be of the greatest importance. At the earliest moment when our finances will warrant I hope to see this plan adopted.

We closed our last year with an Active membership of 48 and an Associate membership of 25, and have honored two men, distinguished in our profession, by placing them on the Honorary roll. This membership represents all the gas companies in this State, with but four or five exceptions, and we are pleased to see that some of the neighboring States are joining our ranks.

The gas business during the past year has shown its usual healthy increase. In answer to a number of queries which I presented to the gas companies on our roll, I have received full and explicit replies from 18. These companies showed a total amount of gas sent out during the year 1897, of 733,577,850 cubic feet, and a total increase of 69,784,450 cubic feet. I am sorry to note from these reports that the unaccounted-for gas showed an increase during the past year; the total amount of this was 57,981,678 cubic feet, an increase of 3,295,330 cubic feet. When we consider that it costs just as much to manufacture gas which leaks through our mains, it is surprising that greater efforts are not made to reduce this amount. With many companies there is a large amount of pipe in the ground which has seen long years of service. If they would but stop to consider the annual loss which this entails, I think they would find that the replacing of the pipe would be a decidedly good investment. Of the companies reporting on such unaccounted-for gas, eight showed an increase, only five a decrease, and one remained practically the same.

The total miles of new main laid during the year was shown to be 35; and new services, 2,968. Comparing the number of new services laid with the increase of output during the year, shows 23,000 cubic feet per service; and the average amount of gas sold for each of the 37,387 meters which are in use gave 23,000 feet per meter. This would tend to show that while the increase has been good it has been almost entirely due to new consumers on our lines. If the proper efforts were brought to bear on the minds of our old consumers, by urging upon them the introduction of special utensils for the use of fuel gas, and by substituting suitable reading lamps for oil tanks, I think a decided increase could be made with the same number of consumers. It costs but very little more to take care of one consumer using 40,000 feet per annum than it does one using 15,000 feet per annum, and in this way our distribution expense would be reduced.

We have not been slow, however, in the introduction of gas appliances. The number of companies reporting that have kept accurate record of the installation of such appliances is 16: 1,387 gas ranges have been set; 477 hot plates; 129 water heaters; 532 heating stoves, and 12 gas engines. This large number should certainly have tended to increase our sales more than is shown by the report, and we have evidently fallen off in other lines. It hardly seems possible that the introduction of Welsbach lights could be responsible for such falling off, although the remarkable number of 104,319 of these lights is now in use in this State; of which 34,636 have been placed during the past year. We will assume that half of these have replaced the ordinary gas burner; but I think that we can easily give the other half credit of getting new business for us.

As to the life of mantles, the reports were all the way from three months to over a year. It hardly seems possible that this great variation can be due to anything except the care which these lamps have received. The average life of a mantle is shown to be eight months. All the companies reporting, except one, sell the incandescent lamps themselves, and one company handles lamps other than the Welsbach.

No one is as deeply interested in the successful installation and satisfactory maintenance of these lights as the gas companies themselves, and too much importance cannot be placed upon our handling this branch of business personally. The so-called infringing incandescent lamps are sold in nearly all the cities, and the universal opinion seems to be that they are not satisfactory. It has been my personal experi

ence that this dissatisfaction has been due, in part at least, to the fact that the parties handling them are densely ignorant of their use and adjustment.

As I stated before, only 12 gas engines have been introduced during the year. It is difficult to get the public to appreciate the real benefit of these engines, and still more difficult to get the necessary information and satisfactory co-operation of the manufacturers of the engines. Should the engine makers enter the field with as much enthusiasm as the gas stove men have done, we would have a much easier path to travel in this direction.

The Legislature in session during last winter saw the introduction of many bills which were of interest to our industry. Thanks to their superior intelligence, hardly a bill which was detrimental to our business was passed. The bill providing for the punishment of persons fraudulently obtaining water, gas and electricity was passed, and will no doubt be of great value to us. We can congratulate ourselves on the successful issue of what seemed at our last annual meeting a severe menace to our industry.

But few improvements of importance have been suggested during the year in the manufacture of gas. Owing to the low price of coal, and the good prices received for residual products, there has been a strong tendency toward the use of coal gas processes in betterments and extensions.

Each year about this time the question of disposing of our surplus tar confronts us. Unfortunately for us our maximum sale of this product occurs at the time of our minimum manufacture of the same, thus requiring a large storage capacity. During the summer months we are able to get good prices for our tar, largely for local use; during the winter there is too much put upon the market, and the price is very much depressed. Many gas companies have made strong efforts toward the introduction of tar for paving and roofing purposes to increase their local sales of tar. These companies have been unable to receive a fair price for their product, while some outside companies, which have done nothing for making a market for tar, step in on their fertile territory and sell at a price much below that which they have been asking. This certainly seems unfair, and is a point upon which our Association could heartily take some action. I believe this suggestion will be presented to you at this meeting, and I trust you will all give it your hearty support.

The coke market is largely a local question with each of us, and we all have our own competition to meet in this line.

Gas companies are just waking up to the fact that they must do business on the same lines as other mercantile enterprises. To sell their product they must advertise, and too much ingenuity and thought cannot be given to this point.

When the President finished reading the address, it was referred for consideration and report to a committee consisting of Messrs. Sedgwick Dean, W. H. Morgans and Robt. Calhoun.

[To be Continued.]

A Curious Old Gasholder.

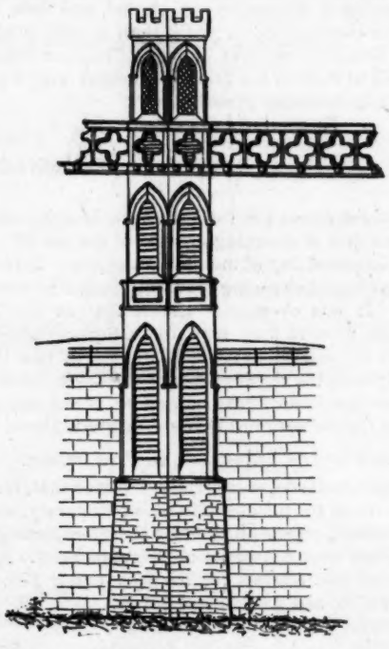
By TRAVELER.

The modern gasholder, with steel tank and trussed steel framing, giving such strength and lightness for the least expense, has become so generally in use that it bids fair to completely supplant all former styles. While this is quite proper from an economic standpoint, it yet means the gradual passing of the older forms of holders that marked the development of the gas business in its first stages in this country; holders costly, quaint and queer, as we view them, yet noble in their day and historic now, and have linked with them still no small measure of sentiment and attachment by those who have been identified with them.

Of all the holders in the United States that might fall within this description, there is probably none more curious or more interesting than the "stone column holder," at the Point Breeze station of the old Philadelphia city gas works. While it is called "the holder with stone columns," this designation is a bit misleading; for, as a matter of fact, while stone is used for a distance of perhaps 16 or 18 feet above the ground level, the greater part of the columns is of iron. The architectural design of this superstructure, however, is so unusual that interest in it still attaches despite the absence of stone all the way up.

It seems that when the Point Breeze gas works was built, along in the early fifties, the design, according to current works' tradition vested in the hands of the late Dr. Cresson, for many years identified with gas matters in Philadelphia as engineer and chemist. He designed the plant, and whatever his ideas about other parts of it were, his ideas as to the buildings were certainly unique. In design they were Gothic at every point possible. The two retort houses resemble parallel churches, minus steeples, so completely are the stone exteriors made up of high-pointed arched windows, cluster columns and other earmarks of Gothic architecture. The meter house equally resembled a chapel, and it would take but little stretch of the imagination to convert the blacksmith and other shop buildings into parish houses, so completely was the Gothic and church effect carried out. While this may have been a harmless whim, for one with a city's money in plenty, it was yet close to an absurdity as applied to a gas works, for the narrow Gothic windows gave a great insufficiency of light throughout the plant. However, the works were so built, even to the holder; for the Doctor made that Gothic, too. He could not exactly put church windows into the shell proper, but the columns and connecting girders were respectively filled with such windows and with detail work, to an extent beyond that which one would suppose possible.

The holder was a pretty big one in those days. It is of the double-lift order, of some 160 or 180 feet in diameter, having a capacity of a million and two-thirds feet or over, and as 12 Gothic columns were constructed to serve as guide rail supports, the effect is massive in the extreme. Each column in section is five-sided. One side faces in and carries two guide rails for twin guide wheels on the holder. Each column at the base is made of stone masonry work, some 12 feet thick through. This tapers slightly to a height of 16 or 18 feet where the iron work commences that continues to the top. This iron work is covered



with a painted sheathing, and through the medium of this sheathing the Gothic column effect was secured, chiefly by inserted windows. The two lower rows are slatted; the upper one is glazed with diamond lights, all in harmony with church effects. About four fifths of the way up the connecting girders span from column to column, and even these girders, as may be noted in the freehand sketch accompanying, carry out the general scheme. The columns are hollow, and about every third one has an entrance door in the base for access through it to the crown above. The present holder proper in active daily use is apparently conventional in every respect. It is not likely, however, that it is the original one, erected over 40 years ago (1856 ?), but a more modern structure succeeding the first.

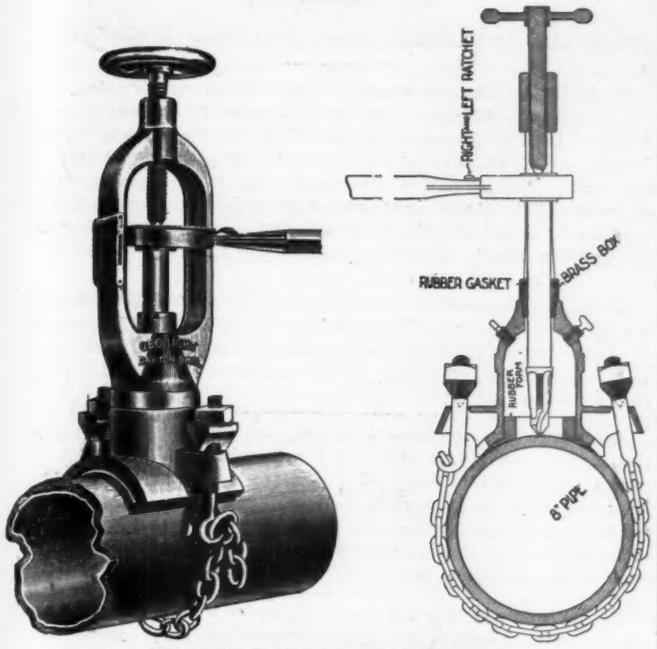
The sheathing of the columns makes them appear very massive, and this, in connection with their number and the height of upwards of 80 feet, makes the entire structure a landmark visible for miles in the flat lands around the mouth of the Schuylkill. Through the mist, and from a distance, they quite suggest the Stonehenge temple of giant Druid stones.

THE reduction in the gas rate at Sioux City, Iowa (from $1.40 net to $1.30 net), has resulted in an increase in sendout even greater than that predicted by Supt. Kellogg.

The Light Drilling and Tapping Machine for Service Connections.

It goes without saying that the drilling and tapping of holes in main pipes for service connections should be properly and carefully done, for a large amount of leakage can be traced to defective holes made with an open drill and tap, which practice allows a large amount of gas to escape in the faces of the men doing the work. They necessarily want to get away from it as soon as possible, and the tap is forced, threads being torn off that should be perfect. Where 1¼ and 2-inch holes are to be tapped, two or three men are required, to relieve one another to prevent them being overcome by the gas.

The two cuts illustrate a modern tapping machine, with which one



The Light Drilling and Tapping Machine.

man can drill and tap perfect holes, from three-fourths of an inch to 2-inch inclusive, without any escape of gas.

The frame of the machine is made of malleable iron, strong and compact. On the side of the machine is a level, to give the correct angle to holes drilled and tapped in the side of the pipe. The clamp and chain are of a length suitable to be adjusted to from 2-inch to 36-inch pipe. All working parts of the ratchet, which is reversible, are inclosed. The combination drill and tap is of a special pattern. The drill is of the twist drill style. The machine is manufactured by Mr. Geo. Light, of Dayton, Ohio.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Feb. 10th, 1898.

The Gas Industry of the United Kingdom—A Satisfactory Report on Sulphate—The Gas Light and Coke Company.

The Parliamentary returns relating to gas undertakings in the United Kingdom for the year ended 31st December, 1896, have just been issued, and as usual afford some useful information. They refer to 433 companies or joint stock undertakings, and to 208 works belonging to local authorities. There is no pretense at presenting an exhaustive list of every undertaking throughout the country, but only those under Parliamentary powers are listed. So it must not be concluded that there are only 641 gas undertakings in the United Kingdom. The costs, even under the cheaper procedure afforded by the Gas and Water Facilities Act, 1870, of obtaining an Act are so great that many undertakings, holding under £20,000 capital, prefer to do without the somewhat doubtful advantages of Parliamentary protection. The totals of the various items published in the returns show that the industry is a large and extensive one, and, further, that it is still young and vigorous. A favorite delusion amongst electric circles is that gas is getting old and decrepit, that it has already passed its zenith and is going down the hill; the obvious conclusion being that the public are so far satisfied with the superior advantages afforded by the electric light that they have to a large extent discarded gas in its favor. This view is not supported by the stern logic of facts contained in the Parliamentary report. The total amount invested in the gas industry has now reached 76 millions sterling, while the income is nearly 20 millions, and the expenditure 14½ millions. There are 24,500 miles of gas mains (just about enough to girdle the earth), 2,850,000 consumers, and 540,000 public lamps; the increase on these items being about 4 per cent. for the year. Nearly 12,000,000 tons of coal were carbonized, and the make of gas was 127,000 million cubic feet. A new feature introduced in this year's returns is the addition of two columns relating to the use of materials other than coal—an innovation which is of marked importance, as showing the steady development of a new era in our industry, and also that the government are alive to the representations that have been made as to the poisonous properties of water gas. That there is good ground for the introduction of these details is shown by the fact that some 50 companies, and about half that number of local authorities, own up to the use of other materials besides coal, of which 12 companies and 7 authorities make carbureted water gas. And this, it may be added, has not been attended with any noticeable increase as regards fatalities by gas. Consumers have gone on in the same old way, looking at the amount of the bill through the magnifying, and the quality of the gas through the diminishing end of the mental telescope, without noticing anything about coal, petroleum or carbonic oxide, unless a clamor was raised to attract their attention. Information is asked for as to the maximum proportion of water gas supplied—that is to say, what percentage of it is contained in the mixture supplied to the public; for there is no case of straight water gas being supplied at present. Such was practiced for a time in a district at Liverpool, but was discontinued in January, 1897. No one, however, appears to have defined any limit that should not be surpassed, either on sanitary grounds or other cause, and the proportions used are entirely according to convenience in working. The Gas Light and Coke Company, for example, supply approximately one-third of their demand in straight coal gas, and of the remaining two-thirds, one ninth contains 35 per cent. and the residue 15 per cent. of carbureted water gas. The fact that this diversity should prevail, without attracting public attention, is of itself a proof that so long as the prescribed standard of illuminating power is exceeded, the consumer may have anything between *nil* and 35 per cent. of water gas without suffering loss or disadvantage. The general practice appears to range between one-fourth to one-third of carbureted water gas, and it is evident that one reason for introducing the water gas generator is to obtain greater elasticity in producing power than is afforded by the ordinary bench of retorts. The use of gas for warming purposes has the effect of increasing the variations in demand from day to day. The mild January just experienced means a general decrease in consumption of 5 to 10 per cent. The result is that in large towns a storage of 1½ to 2 days' maximum was found to be necessary, if the retorts are to be worked to the best advantage. This means a heavy addition to the capital account, and also to annual charges, for gasholders require periodical painting and overhauling. The fact that the generator can be put into full working order, starting cold, in four hours, while the coal retort bench requires at least four days, has led many gas engineers to put in a water gas plant instead of a new holder. For this reason the installation of carbureted water gas is to be regarded as something more than a mere economy in manufacture. It is an alteration in gas engineering practice. We boast sometimes of being able to store gas, and it is undoubtedly an advantage to be able to do so; but gasholders are troublesome and costly things, and we are not sorry to do without them. The public do not admire our gasholders, and if they can be possibly made a little less prominent it will be a good thing. Storage is well, but elasticity in generating plant is better.

At a meeting of agriculturists, held a few days back, the Chairman declared that farmers received a great deal of gratuitous advice from outsiders, as to what they ought to do and what they should leave undone, and amongst other things said that they were advised upon the subject of the best manures to use, by people who could not possibly know anything about it. This had a particular interest for me, because somebody—a very special friend—had sent some leaflets on sulphate of ammonia to the gentleman who uttered these remarks but a short time before. Now agriculturists are not the only class who are troubled with outside and irresponsible advice. There is not a single gas engineer who does not number amongst his customers an individual who is certain that if his advice was followed, gas could be sold in the district at half the present price, while at the same time the shareholders would

have a larger profit. But it is not always well to treat outside advice with contempt. Outsiders see the best of the game, and years of routine have a somewhat paralyzing effect, so they are often able to direct attention to little matters that escape attention in the ordinary way. Perhaps there is some presumption in sending a farmer a pamphlet detailing the various methods of using sulphate. But it is evident that agriculturists generally are not as well acquainted with the properties of that salt, as they might be in their own interests, and also that the manufacturers have not been so active in advertising it as they should have been. This latter omission is about to be rectified. Meanwhile the attention of all who make sulphate may be directed to a report which appears in an agricultural paper, giving the results of experiments with various manures, that have been conducted on Lord Roseberry's experimental farm, situated near Edinburgh, on a working scale, and which places sulphate at the head of all nitrogenous manures, not only as yielding larger, but better quality crops. With regard to hay the bulk was greater, and analysis showed a great superiority in the matter of albuminoid nitrogen. Applied to potatoes, sulphate yielded better all-round results than nitrate of soda. This was confirmed in the case of turnips, for which the most profitable manure was found to be a mixture of superphosphates, lime compost and sulphate. Very similar results were obtained with oats. All of this shows that plenty of valuable material is already available for the assistance of the Sulphate Committee, in their endeavors to spread accurate knowledge on the manurial value of sulphate. This product being manufactured in almost every town of any importance in the country, is at a great advantage over nitrate of soda, which must be shipped from another continent, or over artificial compounds that are made at particular places. In the majority of cases sulphate could be used within a few miles of the works where it is made, thus avoiding carriage and other charges. It is too much perhaps in these days of free trade to say that a point should be strained in favor of the home industry, nor is there any necessity to fall back on such an excuse. When properly advertised, the bulk of the sulphate will, like coke, be either fetched in purchasers own wagons or delivered by arrangement, without going outside the district.

The ordinary half-yearly meeting of shareholders of the Gas Light and Coke Company was held last week, and the proceedings possess more than the ordinary degree of interest. The Chairman first directed attention to two special features in the half year's accounts—viz., the small increase in the quantity of gas sold, and the continued depression in the market for residuals. The consequence of which was that in order to pay the statutory dividends a very large draft on the reserve fund would be necessary, and he went on to argue that these circumstances were entirely beyond the control of the management. The mild winter and absence of dark, foggy weather were largely responsible for the decreased consumption of gas, and also for increased difficulty in selling coke. But it appeared from his statements that, taking the year through, the sales of gas had increased about 4½ per cent., being a larger increase than that for the previous year. And also that the sales of products were improving during the period in question, which improvement has since continued. In other ways business was progressing satisfactorily. They had put on 10,000 new consumers and 20,000 additional stoves during six months. They were increasing the carbureted water gas plant and looked to that as a means of reducing the output of coke for sale besides other advantages. Tar products were worse, but sulphate of ammonia had improved, and he quoted statistics at considerable length to show that there had been a marked improvement on working expenses that were within their control. But it was impossible to avoid increasing the price of gas, though they hoped that the increase would be only temporary, say for a year or so. The present price was 2s. 10d. per 1,000 cubic feet, and the addition would be no more than would suffice to secure the statutory dividend.

Mr. Geo. Livesey did not agree with the explanations given by the Chairman, and, in the course of a long and spirited speech, put the blame for the increased price upon the management. He said that 10 years ago the price of gas was a shade less than 2s. 10d., but yet the Company were paying full profits and had a margin to spare. As to products, many held the opinion that they need not have been so low in price if the Gas Light and Coke Company had adopted a different policy. During the last 10 years the reserve fund had been reduced from £807,000 to £62,000, a state of things that called for serious consideration. In 1894, the Company decided to supply meters free of charge, and thus gave away £60,000 a year. But it was a fallacy to say that the meter was free, as it was simply included in the price of gas and the consumers had to pay for it just as before, but the difference was that the large consumer had to pay for the small one. Then having decreased the income, the Directors increased the dividends, and, in fact, paid more than they were able to earn. Then the carbonizing wages paid by the Company amounted to 3s. 6d. per ton. Other companies had reduced this item at least a third by introducing inclined retorts and other improvements, and if the Gas Light and Coke Company had done the same they would have more than covered the present deficiency. Then in the past 10 years the capital had increased at the rate of £828 per addditional million cubic feet sold, but other companies had found £300 sufficient. Part of this was due to unnecessary extravagance in the supply of slot meters and fittings to the customers. He expressed a wish for a committee to be appointed to test the truth of the statements which he had made, and moved a resolution to that effect, but it was declared to be out of order, and the Directors' report was carried in the usual way.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the Gas Light Company of Augusta, Ga., the officers elected were: Directors, George T. Barnes, Leonard Phinizy, John R. Schneider, Thomas R. Wright and John M. Walton; President, Geo. T. Barnes; Secretary and Treasurer, H. B. Adam. It was also decided that on and after the first day of April next, the price of gas would be reduced to $1.50 per 1,000 cubic feet, provided the accounts were settled on or before the 10th day of the month in which the same were rendered. The ruling rate is $2 per 1,000.

At the annual meeting of the Petersburg (Va.) Gas Light Company the officers chosen were: Directors, John McGill Nelson, T. Patterson, Dr. H. G. Leigh, Sr., David Dunlop, John W. Bradbury, J. G. Dunn and W. H. Baxter; President, John G. Dunn; Treasurer and Superintendent, W. H. Baxter.

Mr. Hoertz, the official gas inspector for Louisville, Ky., reports that during January he tested, on the complaint of consumers, 111 meters. Of these 10 were over 2 per cent. fast and 23 were more than 3 per cent. slow; while the others (78) were within the limits of accuracy prescribed by the ordinance. The latter provides that meters shall be deemed inaccurate when their registration is shown to be 2 per cent. against the consumer or 3 per cent. against the Company.

We are informed that the patent rights for what is known in this country as the Nomatch self-lighting incandescent gas mantle—controlled here by the Adams Nomatch Light Company—have been sold to a large corporation in Germany, the rights disposed of also covering the territories of Russia, Norway, Sweden, etc. The goods will be put upon the market at once, large orders for them having been received by the new Company.

"Observer," writing under date of the 21st inst. says: "It was interesting to see the Attorney for the Massachusetts Pipe Line Company stand up before the Board of Gas and Electric Light Commissioners, in the recent hearing upon the legality of the issue of $1,000,000 stock which had been emitted over the heads of the Commission, and state that what they wanted was an opportunity to sell a gas which will be 'entirely free from the noxious element and the danger element of carbonic oxide.' It appears from his statement that the organizers of the Company are falling over each other in an attempt to invest their money, so the community shall have a safe gas, and one which the 'public demands, needs and wants.' It seems according to his ideas that it is impossible to reduce the percentage of carbonic oxide to a safe point—which in his opinion is 10 per cent.—without the Boston companies going to so vast an expenditure of money that the price must be increased; but by the means of this issue of stock the whole question will be settled at once and Boston will get its gas *without any increased cost.* This is somewhat different from the statements of the past, wherein we learned gas was to be sold for 50 or 60 cents—a much reduced rate. It is needless to say such statements didn't impress the Board. They have a keen discrimination as to what is good gas, and promptly declared the issue illegal. Following this declaration comes Mr. Lawson's statement that, as the issue of stock was illegal, there was no Company which had power to contract with the Boston Companies for gas for 50 years, so these contracts are all illegal; hence subscriptions to the $14,000,000 New England Gas and Coke Company's bonds were obtained by fraudulent representations. In fact the whole matter is illegal and will be destroyed, and he invites subscribers to the bonds to join him in a suit to be released from their obligations to take the bonds. Meanwhile the well-intentioned gas man in Massachusetts

sits on the fence, pulls his legs up under him, and says: 'Sic 'em, Rover.'"

A BILL introduced in the Senate by Mr. Higbie, from the first senatorial district, seeks to amend the New York game laws by providing that no dye stuff, coal tar refuse from gas houses, sawdust, shavings, tan bark, lime or other deleterious or poisonous substances shall be thrown into the waters of the State in any quantities whatever.

SECRETARY L. T. PALMER, of the Leavenworth (Kas.) Light and Heating Company, is (and with much reason) well satisfied with the gas outlook in that city. The increase in sendout during 1897, as compared with that for 1896, amounted to 34 per cent. The Company has just added a bench of 6's to its generating equipment.

MESSRS. A. J. Essenmyer and F. A. Wishart, who control the "right" to make and sell acetylene gas machines of one type or another in Springfield, Mo., had occasion some days ago to examine a machine that was not working satisfactorily. Essenmyer was holding a naked light to enable Wishart to inspect the magazine of the machine, and the apparatus blew up. The last named was severely burned, as was a workman named Holden. Essenmyer escaped uninjured.

THE following inquiry, from the Engineer of the Shanghai (China) Gas Company, is submitted for the consideration of our advertisers:

THE SHANGHAI GAS COMPANY, ENGINEER'S OFFICE,
SHANGHAI, Jan. 14, 1898.

To the Editors AMERICAN GAS LIGHT JOURNAL: I see by a recent number of the *Journal of Gas Lighting* that an American firm has offered to supply gas coal to Glasgow, Belfast or Liverpool at 8s. 3d. per ton. Is there any doubt about the correctness of this statement? If not I should wish to be put into communication with the firm, with a view to getting good gas coal here. Our present supply is entirely Japanese, and prices have recently been doubled, while the quality has deteriorated in nearly the same proportion. This, of course, is very bad for our business, and I am on the lookout for any possible source whence I can obtain better quality, even at the same price. The present quotation for house coal is $12.50, Mexican, for very soft and poor material; but, of course, we get it at slightly easier rates. Thanking you in anticipation for your kindly attention. Yours faithfully,

H. KING HILLER, Engr.

ACCORDING to the annual report of the Public Lamps Inspector (Mr. Henry H. Hopkins) for New Haven, Conn., at the end of 1897, the number of street lamps in use was 1,695—electric, 442; gas, 743; naphtha, 510. The Inspector, speaking of the Welsbach street lamp, says: "At present there are 105 Welsbach lamps in use, which give good satisfaction." The new time table for lighting took effect January 1, 1898; it calls for 4,000 hours lighting per lamp per annum—an increase of 53 hours per lamp per annum over the old schedule. The total expenditure on street lighting account for 1897 was $75,300.07.

THE Welsbach Street Lighting Company, of America, has submitted the following proposition to the authorities of Richmond, Va., respecting a part of the public lighting of that city: "We will furnish and erect on your posts lamps such as are now on exhibition in your city; furnish gas for same and labor for lighting, cleaning and extinguishing; light lamps every night in the year, from dusk until dawn; keep burners and lamps in repair, and furnish sufficient mantles to at all times maintain a 75 candle power light, for the sum of $30 each per year. We to purchase gas from your city, at $12 per year, delivered at the burner for each lamp, and to make allowance to you for same, making the net cost to you, for each lamp, $18 per year." The proposition was referred to a special committee (Messrs. Wallerstein and Noble, of the Committee on Light, and Superintendent Knowles of the gas works) for investigation and report.

THE following action was taken, at a special meeting of the Board of Directors of the Laclede Gas Light Company, of St. Louis, Mo., convened for the purpose of preparing a suitable minute to the memory of the Company's Treasurer, the late Mr. J. D. Thompson:

"OFFICE OF THE LACLEDE GAS LIGHT COMPANY,
"ST. LOUIS, MO., Feb. 16, 1898."

"At a meeting of the Board of Directors held this day, the following preamble and resolution were unanimously adopted:

"The Board has learned with profound regret of the death of James D. Thompson, the Treasurer of the Company. Mr. Thompson was connected with the Company in various capacities for more than 23 years. He has been Secretary, Treasurer, Vice-President and Director, and in every capacity has served with ability and fidelity. He devoted the best years of his life to the promotion of the Company's interests, and has deserved the gratitude of all its members. His intelligence and courtesy won the personal regard of every member of the Board. The fortitude with which he endured a long and painful illness and the cheerfulness with which, under the most trying circumstances, he discharged the duties of his office, enlisted the cordial admiration of all who came in contact with him.

"*Resolved*, That this memorial be spread upon the minutes of the Board, and that the Secretary deliver a copy to the family, with the assurance of its profound sympathy in their affliction.—THE LACLEDE GAS LIGHT COMPANY, by A. Ross, Secy."

AT the annual meeting of the Newark (N. J.) Gas Company the Directors chosen were: C. A. Lighthipe, Henry C. Kelsey, E. L. Joy, Andrew Kirkpatrick, G. E. Halsey, E. B. Gaddis, George B. Swain, Richard C. Jenkinson and John C. Kirtland—the latter was chosen in place of Henry Powles, retired. The Directors subsequently perfected the following organization: President, Henry C. Kelsey; Vice-President, E. Luther Joy; Treasurer, Jas P. Dusenberry; Secretary, Clarence L. Nelson.

THE Exeter (N. H.) Gas Light Company will remove its office headquarters to a well-furnished floor in the eligibly located Nealy and Wadleigh block on Main street.

THE office quarters of the Lockport (N. Y.) Gas and Electric Light Company have been removed to the Tyler building. This change will be appreciated by the Company's patrons.

PROF. P. B. WILSON has been reappointed Inspector of Gas and Illuminating Oils for Baltimore. This act of Mayor Malster goes to show how thoroughly competent Prof. Wilson is for the named important post, for although the Mayor is a Republican, Prof. Wilson is a Democrat. We congratulate them.

THE gas and electric light properties in Little Falls, Herkimer, Ilion and Mohawk, N.Y., have been purchased by a syndicate, who are said to have other purposes (notably the operation of electric railways) in view in connection with their lighting investments.

THE Committee on Lighting of the Board of Public Works, of Newark, N.J., having duly considered the application for a franchise to operate a gas works by the projectors of the Peoples Gas Company, unanimously voted to refuse consent. The statement of the Committee in respect to the application is appended:

Whereas, An application has been made by the Peoples Gas Company requesting this Board to grant its consent to lay pipes through the streets in which the Company now furnishing gas has laid its pipes, for the purpose of supplying gas for illuminating purposes to such persons as may desire it; and,

Whereas, The request of said Company is for an unlimited franchise and without offering any return to the city for the same, and that the tendencies of municipal authorities throughout the country are to restrict franchises of this kind; and,

Whereas, The price of gas in this city has been reduced from time to time by the Company now furnishing gas, and from past and present indications it will be obliged to continue such reduction in the future; and,

Whereas, The granting of the request of said Company would be to injure and partially destroy the pavements in said streets, laid at a great expense, and would be an inconvenience and annoyance to both property owners on such streets and citizens at large without giving them or the city any corresponding benefit or return thereafter;

Resolved, That in the opinion of this Committee under all the circumstances, it would be detrimental to the public interests to recommend to the Board the granting of such request.

Resolved, That the Committee declines to make such recommendations and grant the permission to lay said pipes, and the same is hereby refused.

AT the annual meeting of the Salem (Mass.) Gas Light Company these officers were chosen: Directors, H. A. Hale, J. P. Langmaid, J. H. Smith, C. F. Prichard and S. W. Winslow; Treasurer and Clerk, B. W. Sluman.

The Market for Gas Securities.

The general share market for the week reflected the intense feeling of uneasiness that prevails over the inquiry now being conducted to determine the cause of the destruction of the "Maine." Clear headed observers seem to incline to the opinion that the disaster was not an accidental one, and the spreading of this belief is undoubtedly the cause of the financial gyrations witnessed last week in Wall street. Outside of the influence noted no tenable argument may be advanced regarding the decline in gas shares, for the latter are stronger from an internal point than at any prior time of their history.

The situation at Albany in the instance of legislation is satisfactory, and no important conflict of interest between the different city companies exists. Consolidated sold down to 180, and opened to-day (Friday) at 180¼ to 181, with a recovery to 184, and a break at 2 P.M. to 182½. Under the conditions it looks risky to advise a purchase of the shares, but we do say, do not sell. Other city gas shares are much lower, save Mutual, which holds its own fairly well.

Brooklyn Union is at the absurdly low figure of 116 to 116½; Bay State, is 2½ to 3; Peoples, of Chicago, is 89½ to 89¾; Baltimore Consolidated is 55½ to 56; and Consumers of Jersey City, is 78 to 83. Any of these securities should afford good chances for profit at the quoted figures, particularly Brooklyn Union, and Peoples of Chicago. The consolidation of the gas interests of Pittsburgh, Pa., is progressing satisfactorily. The Directors of the Doylestown (Pa.) Company have declared a dividend of 2 per cent., payable to-morrow.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 Wall St., New York City.

February 28.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	182	183
Central	500,000	50		..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	220	226
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	320	360
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	..	
" Bonds	150,000	1,000	..	
New York and East River	5,000,000	100	81	88
Preferred	2,000,000	100	112	115
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	135	141
Preferred	5,000,000	100	155	161
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	116	116½
" " Bonds (5's)	15 000,000	1,000	114	114½
Bay State	50,000,000	50	2½	3
" Income Bonds	2,000,000	1,000	..	75
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	..	90½
2d " " "	3,000,000	1,000	72	75
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104½
Columbus	1,000,000	.	89	91
1st Mortgage	1,085,000	..	101	103½
Consumers, Jersey City	2,000,000	100	78	83
" Bonds	600,000	1,000	102½	105
Cincinnati G. & C. Co.	8,500,000	100	203½	206
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	55½	56
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit	4,000,000		59	61
" Con. Bonds	4,312,000	..	100	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	82	84
" Bonds	2,000,000	..	87	90
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	84	86
Bonds	1,000,000	1,000	89	92
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	40	40¼
Preferred	2,500,000	100	90	91
Bonds	9,084,400	1,000	103	104
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	90¾	91½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	82	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	94	94½
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	2,500,000	25	17	20
Bonds	1,000 000		94	97
Washington, D. C	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	83	84
Bonds, 5's	3,556,000	.	103	104
Wilmington, Del.	550,000	50	200	

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DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY,
40 WALL ST., NEW YORK CITY, Feb. 10, 1898

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable Mar. 10, 1898, to stockholders of record at the close of business Feb. 28, 1898. Transfer books of the preferred stock will be closed from Mar. 1 to Mar. 10, 1898, both inclusive. Checks will be mailed

1185-3 EDWARD C. LEE, Treasurer.

WANTED,

A Man who has had Experience and is Fully Qualified to Lay Gas Mains.

First-class references will be required.

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As Superintendent of a Gas Works or a Gas and Water Works

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Two 50-H P. Otto Gas Engines,

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1175-tf Woonsocket, R. I.

PROPOSALS

FOR

Lighting Streets,

Village of White Plains, N.Y.

Notice is hereby given that the Board of Trustees of the Village of White Plains, N.Y., will, until

TUESDAY, MARCH 22, 1898,

Receive sealed bids for lighting the streets of said village for a term of three years, from November 1st, 1898, upon the following propositions:

First Proposition.—To furnish 75 arc electric lights of 1,200 candle power each, and 100 gas lights of 20 candle power each. All night lighting.

Second Proposition.—To furnish 50 arc electric lights of 1,200 candle power each, and 160 incandescent electric lights of 20 candle power each. All night lighting.

Third Proposition.—To furnish 400 gas lights of 20 candle power each. All night lighting.

Fourth Proposition.—To furnish 400 incandescent electric lights of 20 candle power each. All night lighting.

The bids to state the price per light per year for which lights will be furnished. The Board of Trustees to have the privilege of ordering additional lights of either kind at the contract price per year.

Proposals to be received by the Village Clerk.

Dated White Plains, Feb. 14, 1898.

By order of the Board of Trustees.

S. C. MILLER, President.

W. B. SUTHERLAND, Village Clerk.

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NO EXTRA LABOR OR OPERATING EXPENSES.

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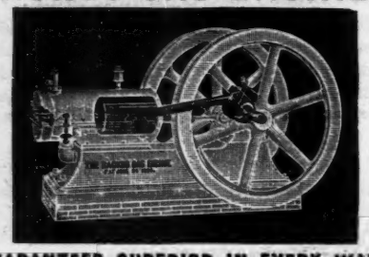

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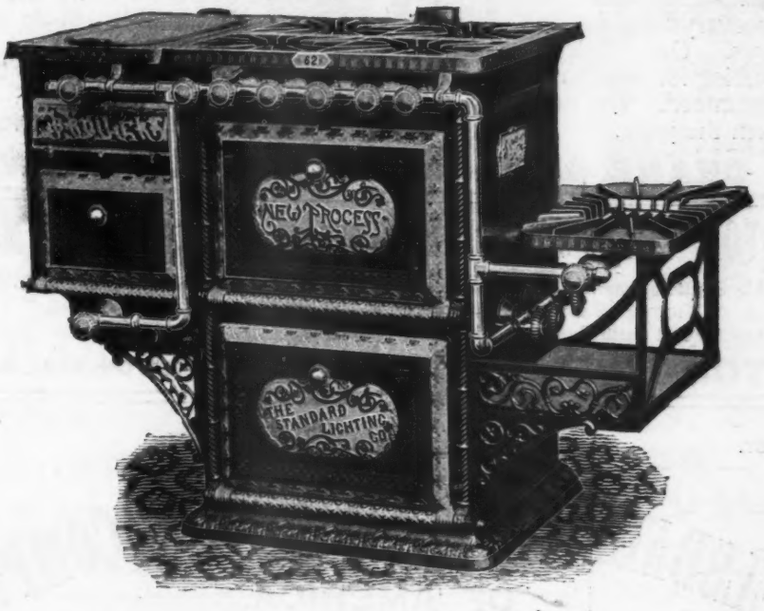

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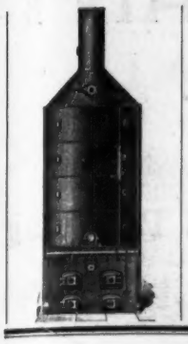

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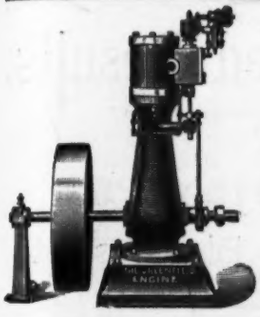

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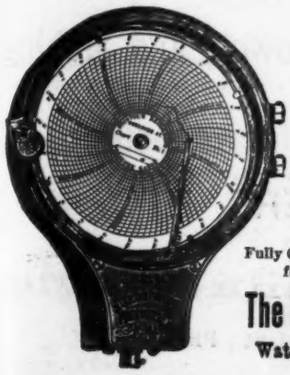

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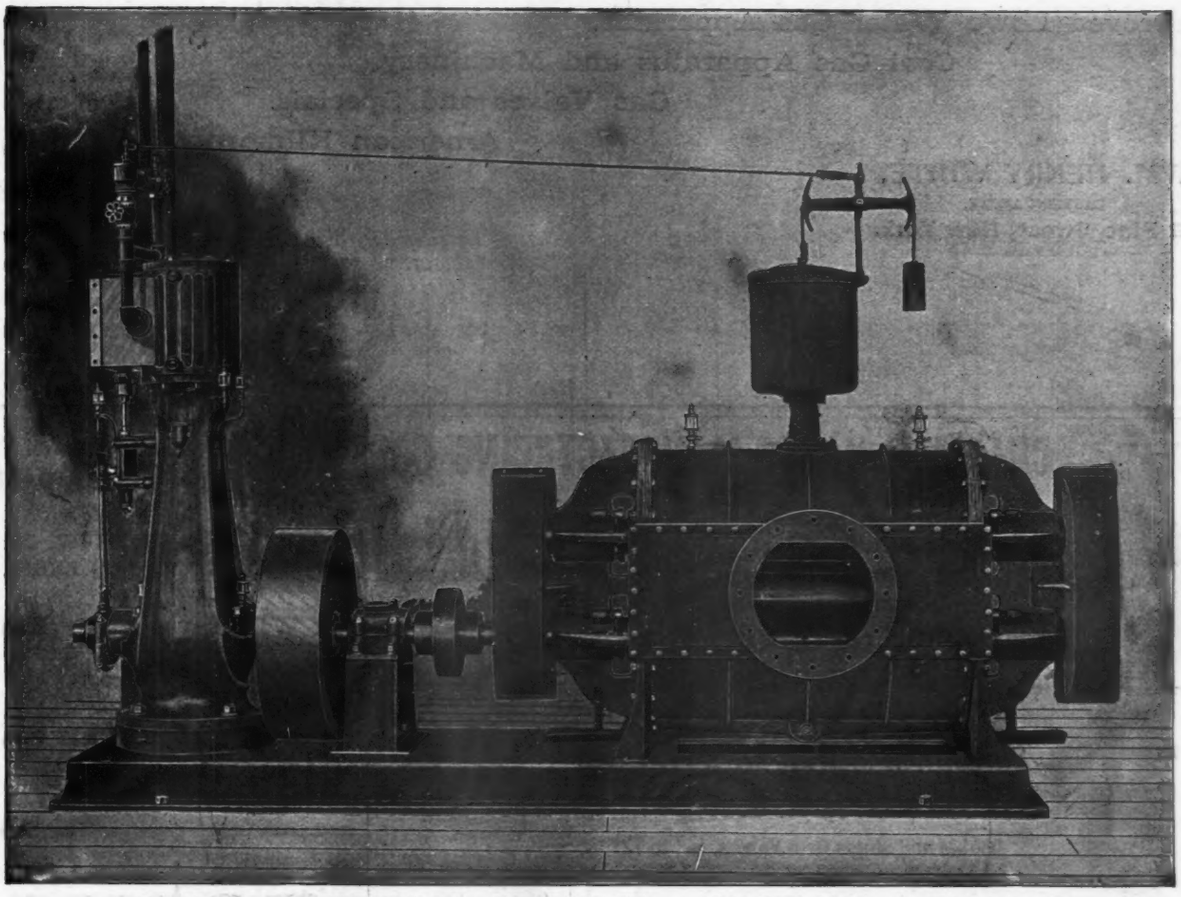

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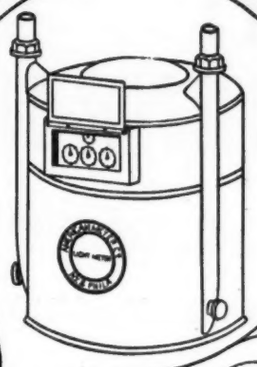
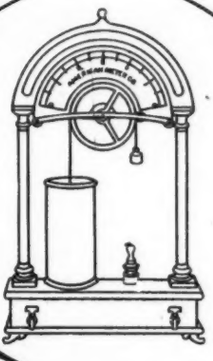
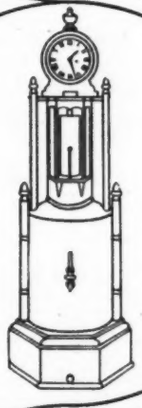
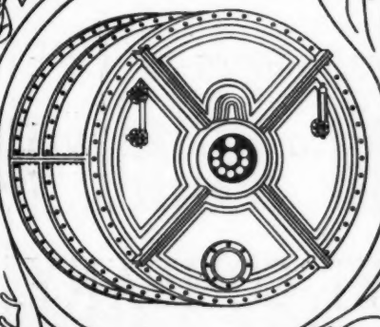




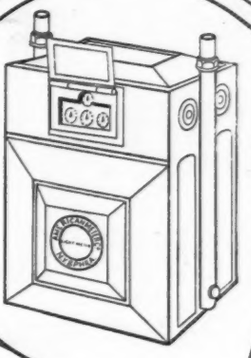


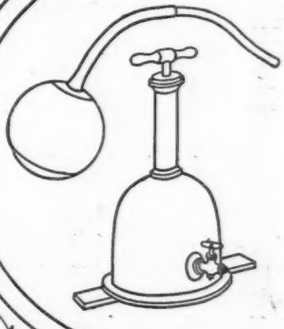


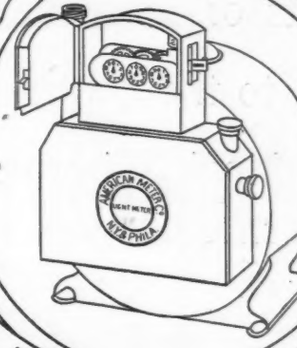
PUBLIC LIGHTING TABLE.

MARCH, 1898.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	2.00 AM	5.30 AM	5.30	5.45
Wed.	2	2.40	5.30	5.30	5.45
Thu.	3	3.20	5.30	5.30	5.45
Fri.	4	3.50	5.30	5.30	5.45
Sat.	5	4.20	5.30	5.40	5.35
Sun.	6	No L.	No L.	5.40	5.35
Mon.	7	No L. FM	No L.	5.40	5.35
Tue.	8	No L.	No L.	5.40	5.35
Wed.	9	6.30 PM	8.50 PM	5.40	5.35
Thu.	10	6.30	10.00	5.40	5.35
Fri.	11	6.30	11.10	5.40	5.35
Sat.	12	6.30	12.20 AM	5.50	5.20
Sun.	13	6.40	1.30	5.50	5.20
Mon.	14	6.40 LQ	2.40	5.50	5.20
Tue.	15	6.40	3.30	5.50	5.20
Wed.	16	6.40	4.20	5.50	5.20
Thu.	17	6.40	5.00	5.50	5.20
Fri.	18	6.40	5.00	5.50	5.20
Sat.	19	6.40	5.00	6.00	5.10
Sun.	20	6.50	5.00	6.00	5.10
Mon.	21	6.50 NM	5.00	6.00	5.10
Tue.	22	6.50	5.00	6.00	5.10
Wed.	23	6.50	5.00	6.00	5.10
Thu.	24	6.50	5.00	6.00	5.10
Fri.	25	6.50	5.00	6.00	5.10
Sat.	26	10.10	5.00	6.10	4.55
Sun.	27	11.00	4.50	6.10	4.55
Mon.	28	11.50	4.50	6.10	4.55
Tue.	29	12.40 AM FQ	4.50	6.10	4.55
Wed.	30	1.20	4.50	6.10	4.55
Thu.	31	1.50	4.50	6 10	4.55







TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45

$500.00 Reward!

THE PUBLIC IS CAUTIONED that imitation and worthless incandescent burners and mantles are being sold by unscrupulous dealers on the representation that they are the genuine "Welsbach."

THE WELSBACH LIGHT COMPANY will pay $500.00 reward for the arrest and conviction of any person representing and selling incandescent burners or mantles as genuine "Welsbachs" that do not bear our trade-mark.

All genuine Welsbach lights have stamped on the brass work "Welsbach System, Patented," and all genuine Welsbach mantles are branded with our trade-mark, "J," and both burners and mantles are sold in boxes bearing our trade name, "Welsbach."

All other incandescent gas lamps and mantles are infringements of this Company's patents, notwithstanding representations to the contrary, and all manufacturers, sellers or USERS of infringing burners or mantles are liable to be and will be prosecuted

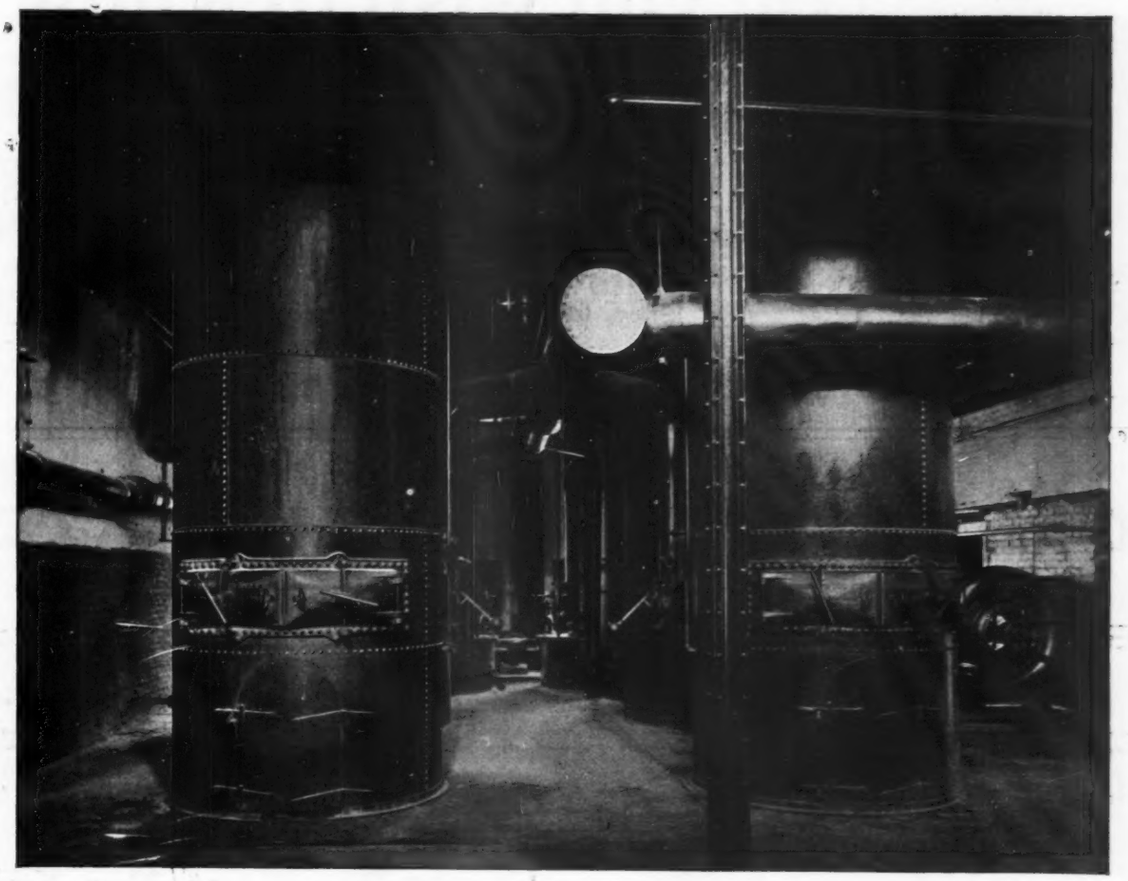
WELSBACH LIGHT COMPANY.

STANDARD

DOUBLE-SUPERHEATER LOWE WATER GAS APPARATUS.

Number of Installations to Date, - - 244

Total Daily Capacity, 131,825,000 Cu. Ft.



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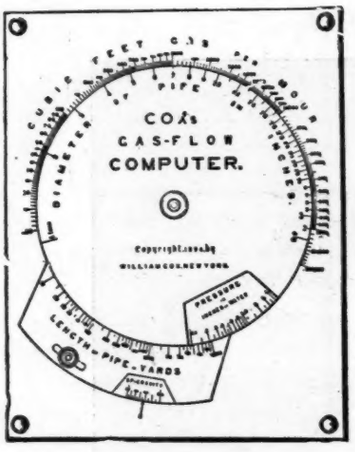

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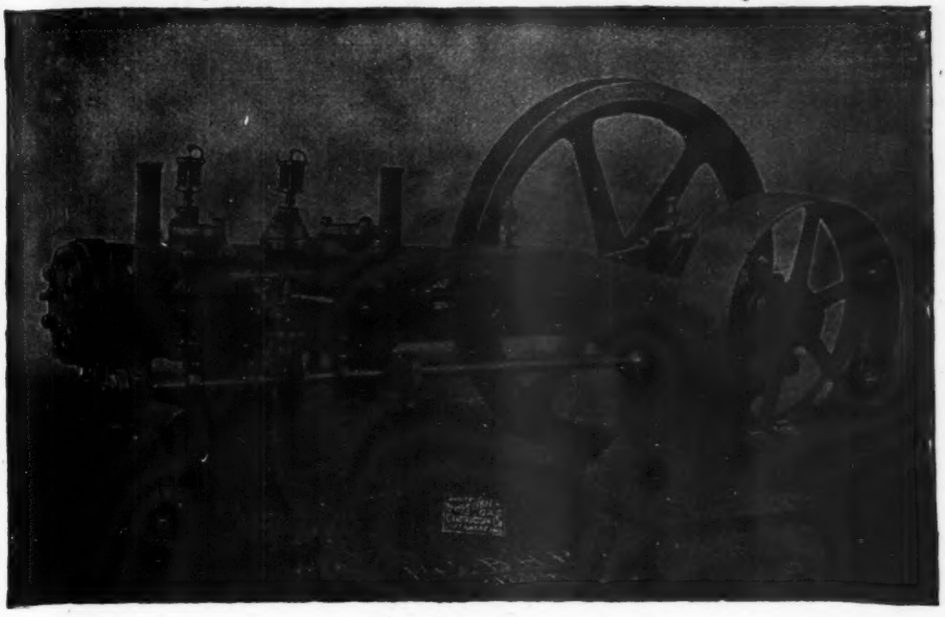

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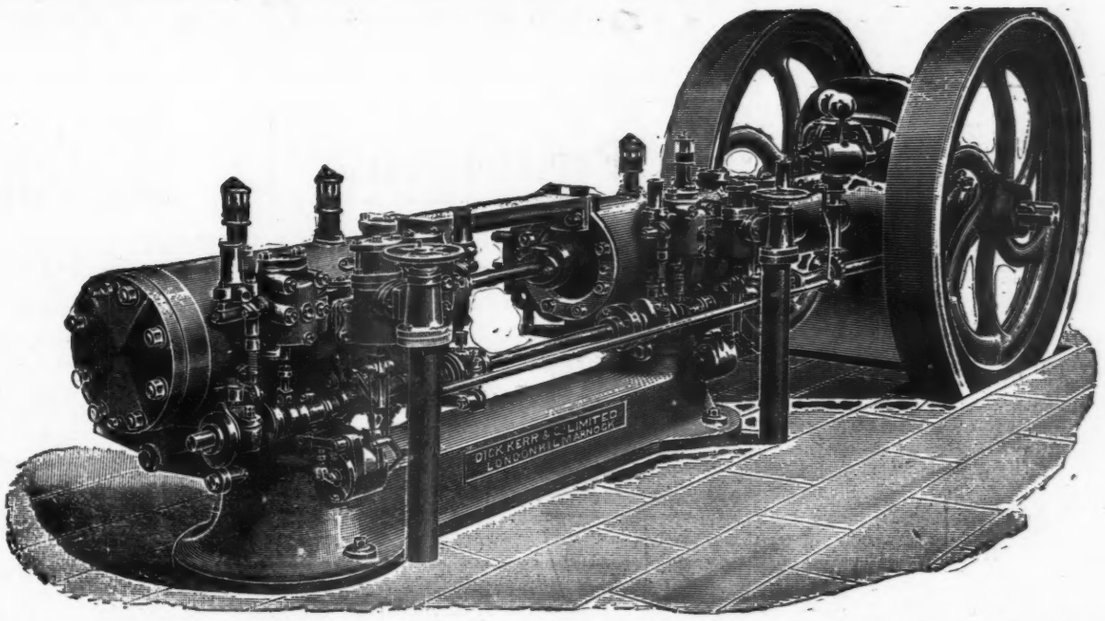

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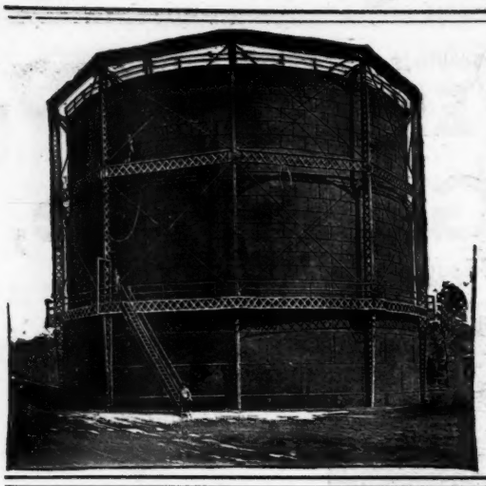

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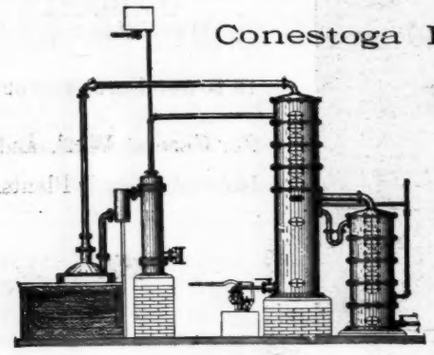

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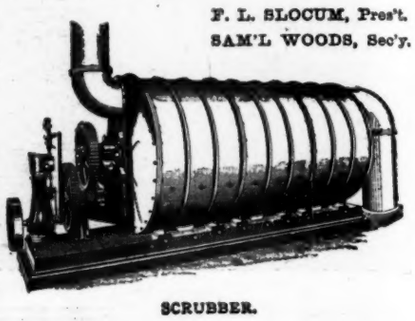

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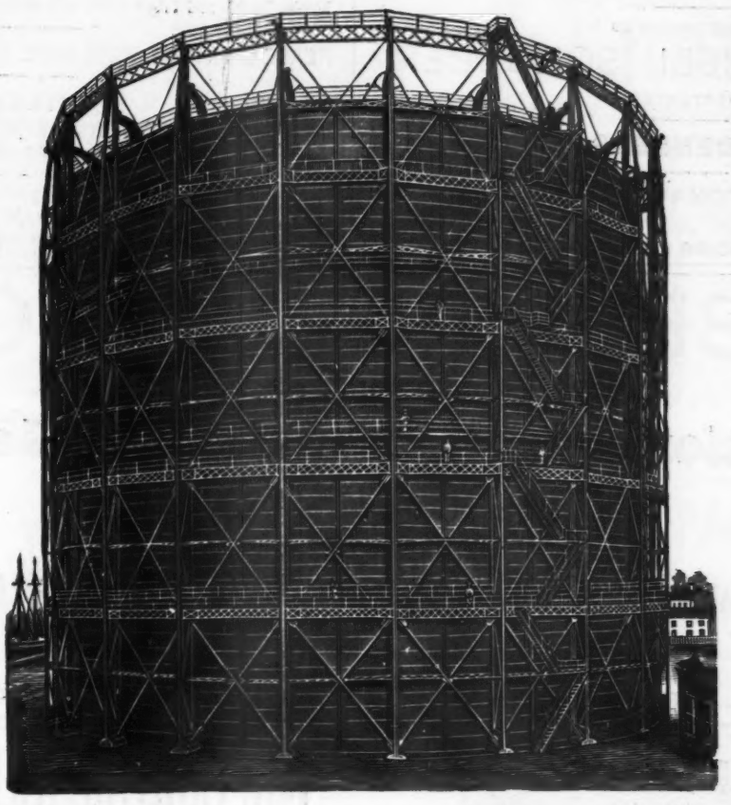

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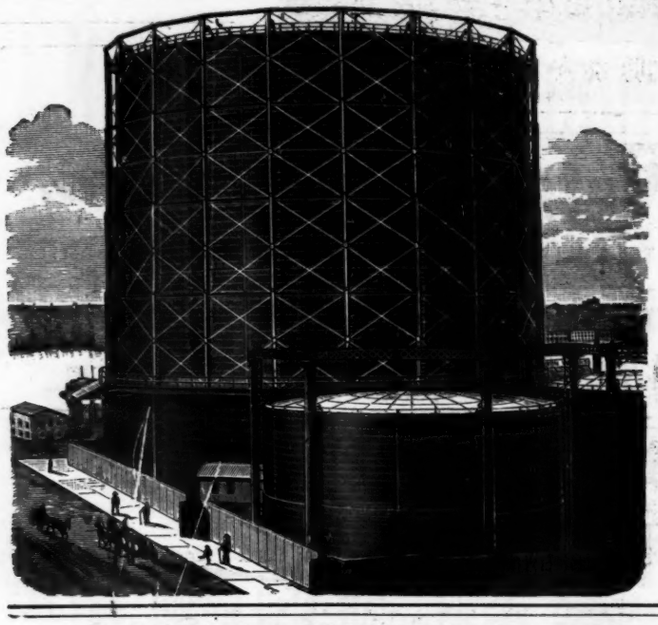

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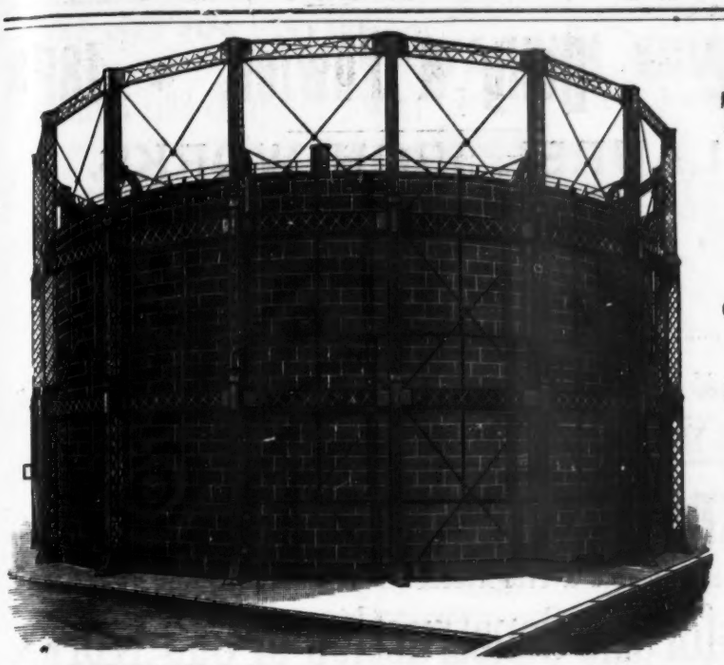

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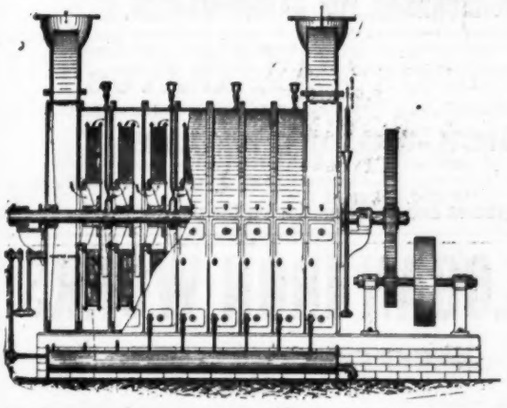

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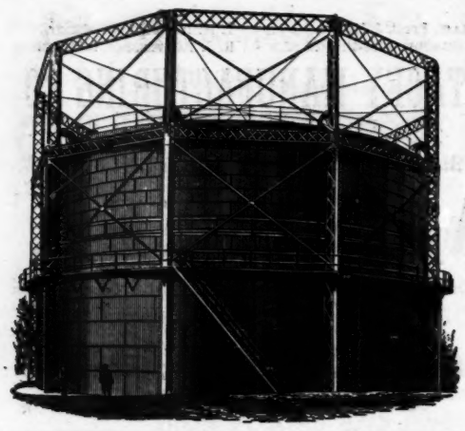

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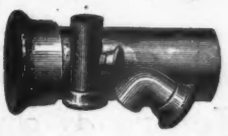
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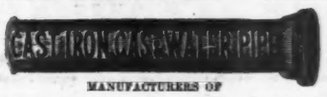
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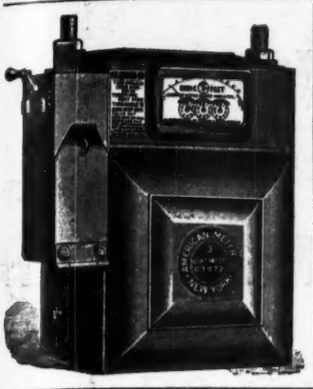

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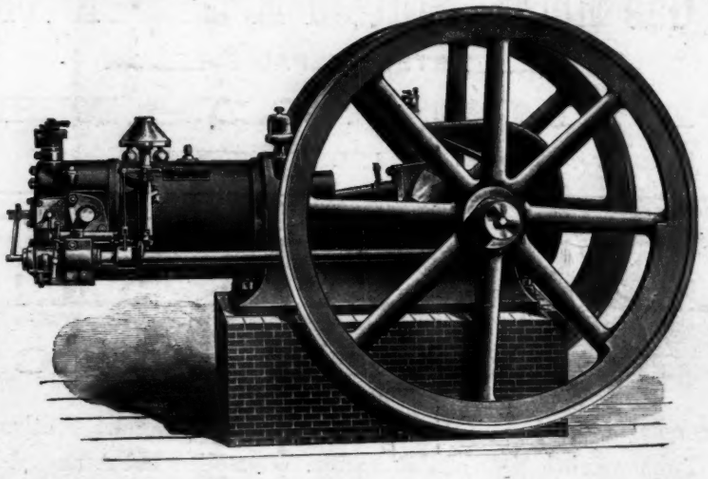

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